Hennessey Board of Education
Regular Business Meeting
Agenda
Monday, August 14, 2023 7:00 PM
Seminar Room, Auditorium
213 N Walnut
Hennessey, Oklahoma 73742

1. Call to Order
   1.1. Roll Call and Declaration of Quorum
   1.2. Welcome of Visitors
2. Public Comments
   2.1. Comments regarding agenda items (please sign speaker list prior to start of meeting)
   2.2. Other comments - Speaker should contact the Supt. or Board President 48 hours (2 working days) prior to the meeting to be placed on the agenda
3. Consent Agenda
   3.1. Minutes of July 10, 2023, regular board meeting.
   3.2. Summary of Financial Activities and Activity Fund Summary of Accounts as of July 31, 2023.
   3.3. Purchase Orders, Change Orders and Corresponding Warrants
   3.4. FFA Trip to National Convention November 1-4, 2023.
   3.5. Stipends for Donor's Choose projects funded prior to August 14, 2023.
   3.6. Fundraisers for 2023-2024 school year.
   3.7. Surplus 6 Lock-n-Charge 20 Chromebook Carts.
   3.8. Contract with Oklahoma Department of Career and Technology for the 2023-2024 school year.
   3.9. Agreement to furnish food service between Eagles Nest Daycare and Hennessey Public Schools for the 2023-2024 school year.
   3.10. 2023-2024 Return To Learn Plan.
4. Regular Business
   4.1. Discussion and possible board action regarding the following board policies: Family Medical Leave; Maternity and Armed School Employees
   4.2. Discussion and possible board action regarding the transfer of $4,000.00 from Sinking Fund 41 to Bond Fund 34 due to payment made in fiscal year 23 out of the incorrect account.
   4.3. Discussion and possible board action regarding architectural plans and bid specs on transportation building to be sent out for competitive bids.
5. New Business
6. Superintendent's Reports
   6.1. Facilities
   6.2. Resignations Received
7. Personnel

7.1. Discussion and possible board action regarding the employment of the following certified staff on a temporary contract and support staff for the 2023-2024 school year.
Certified Teachers: 1-High School Science, 1- High School Math; 1- Elementary
Support: 2 ELL Aides;1 Paraprofessional. 1 Bus Driver

7.2. Discussion and possible board action regarding the following changes to the extra duty assignments:
Add: Chelsea Hoeltzel - Athletic Trainer $6,000; Summer Athletic Trainer $4,000
Barry Crosswhite - Title IX Coordinator - $1,000
Lisa Weaver - Assistant High School Girls Basketball - $1,500;
ASST Summer Basketball $1,500
Hugo Rodriguez - JH Head Boys Basketball - $1,500; Asst. HS Boys Basketball, and Summer Basketball - $1,000
Brian Richardson - Boys Golf - $1,250; Girls Golf - $1,250
Paul Raupe - Asst. Wrestling - $2,000

8. Adjourn

Posted on the south window of the Eagle Event Center located at 605 E Oklahoma Avenue, Hennessey, OK on Friday, August 11, 2023 at 11:30 a.m. by _____, Minutes Clerk.

HENNESSEY PUBLIC SCHOOLS

CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS

HENNESSEY, OKLAHOMA

Renaissance
ARCHITECTURE, LLC

Renaissance ARCHITECTURE, LLC
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SEAL:

STATE OF OKLAHOMA
BERNIE RAYNER COLBERT
20115
LICENSED ARCHITECT

08/11/2023

Digitally signed by Bernie Colbert
Date: 2023.08.11 17:23:08-05'00'

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

SHEET TITLE:
COVER

DATE: 08-10-2023

SHEET NUMBER
G0.001

Date: Aug 10, 2023, 11:22am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\G0.001 - Cover.dwg

ABBREVIATIONS

ACCS	ACCESSORIES
ACP	ACOUSTICAL CEILING PANEL
ACT	ACOUSTICAL CEILING TILE
AFF	ABOVE FINISH FLOOR
ALUM	ALUMINUM
AP	ACOUSTICAL PANEL
AVE	AVENUE
BD	BOARD
BLK	BLOCK
BLVD	BOULEVARD
BM	BM
BTM	BOTTOM
BUR	BUILT-UP ROOFING
CABT	CABINET
CG	CORNER GUARD
CJ	CONTROL JOINT
CLG	CEILING
CONC	CONCRETE
CMPTR	COMPUTER
CMU	CONCRETE MASONRY UNIT
CNCS	CONCESSION
CO	CLEAN OUT
COL	COLUMN
COMM	COMMUNICATION
CONSTR	CONSTRUCTION
CONT	CONTINUOUS
CORR	CORRIDOR
CPT	CARPET
CR	CLASSROOM
CT	CERAMIC TILE
CTCB	CERAMIC TILE COVED BASE
CU	CONDENSING UNIT
CUST	CUSTODIAN
D	DEPTH
DIA	DIAMETER
DN	DOWN
DR	DOOR
DS	DOWNSPOUT
DTL	DETAIL
EA	EACH
EF	EXHAUST FAN
EH	EXHAUST HOOD
EIFS	EXTERIOR INSULATION & FINISH SYSTEM
EJ	EXPANSION JOINT
ELEC	ELECTRICAL
ELEV	ELEVATION
ELVTR	ELEVATOR
EM	ELECTRICAL METER
EP	ELECTRICAL PANEL
EQ	EQUAL
EWC	ELECTRIC WATER COOLER
EXP	EXPANSION
EXPD	EXPOSED
EXT	EXTERIOR
EXTG	EXISTING
FD	FLOOR DRAIN
FE	FIRE EXTINGUISHER
FEB	FIRE EXTINGUISHER WITH BRACKET
FEC	FIRE EXTINGUISHER IN CABINET
FF	FINISH FLOOR
FH	FIRE HYDRANT
FIN	FINISH
FL	FIRE LINE
FLR	FLOOR
FOC	FACE OF CONCRETE
FOF	FACE OF FINISH
FOM	FACE OM MASONRY
FOS	FACE OF STUDS
FRG	FURRING
FRP	FIBERGLASS REINFORCED PANEL
FS	FIRE SUPPRESSION
FT	FOOT OR FEET
FTG	FOOTING
GA	GAUGE
GALV	GALVANIZED
GC	GENERAL CONTRACTOR
GFRG	GLASS FIBER REINFORCED GYPSUM
GI	GALVANIZED IRON
GL	GAS LINE
GLZ	GLAZING
GM	GAS METER
GYP	GYPSUM
HB	HOSE BIBB
HC	HOLLOW CORE
HORZ	HORIZONTAL
HM	HOLLOW METAL
HT	HEIGHT
ID	INSIDE DIAMETER
INSUL	INSULATION
INT	INTERIOR
IT	INFORMATION TECHNOLOGY
JAN	JANITOR
JNT	JOINT
JST	JOIST
L	LENGTH
LAV	LAVATORY
LCKR	LOCKER
LP	LIGHT POLE
MATL	MATERIAL
MAX	MAXIMUM
MB	MARKER BOARD
MECH	MECHANICAL
MEMB	MEMBRANE
MFR	MANUFACTURER
MH	MAINTENANCE HOLE
MIN	MINIMUM
MISC	MISCELLANEOUS
MO	MASONRY OPENING
MTL	METAL
MWLP	METAL WALL LINER PANEL
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
O	OFFICE
OC	ON CENTER
OCC	OCCUPANTS
OD	OUTSIDE DIAMETER
OFC	OFFICE
OFD	OVERFLOW DRAIN
OHDL	OVERHEAD DATA LINE
OHEL	OVERHEAD ELECTRICAL LINE
OHTL	OVERHEAD TELEPHONE LINE
OPP	OPPOSITE
OS	OVERFLOW SCUPPER
OVHD	OVERHEAD DOOR
PCMU	PAINTED CONCRETE MASONRY UNIT
PEMB	PRE-ENGINEERED METAL BUILDING
PGB	PAINTED GYPSUM BOARD
PL	PLASTIC LAMINATE
PLYWD	PLYWOOD
PNL	PANEL
PP	POWER POLE
PRCT	PRACTICE
PT	PORCELAIN TILE
PTD	PAINTED
QT	QUARRY TILE
QTCB	QUARRY TILE COVED BASE
R	RADIUS
RBF	RUBBER FLOORING
RCB	RUBBER COVED BASE
RD	ROOF DRAIN
RE:	REFER TO;
REF	REFERENCE
REFR	REFRIGERATOR
REQD	REQUIRED
RENF	REINFORCED
RENFG	REINFORCING
RH	ROOF HATCH
RF	RESINOUS FLOOR
RM	ROOM
RO	ROUGH OPENING
RTU	ROOF TOP UNIT
SB	SMART BOARD
SC	SOLID CORE
SCHD	SCHEDULED
SDC	SEALED CONCRETE
SDL	STORM DRAIN LINE
SECT	SECT
SIGN	SIGNAGE
SIM	SIMILAR
SP	SOUND PANEL
SPCL	SPECIAL
SPEC	SPECIFICATION
SS	STAINLESS STEEL
SSL	SANITARY SEWER LINE
ST	STREET
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRS	STAIRS
STRUC	STRUCTURAL
SUSP	SUSPENDED
T	TOILET
TAFS	TEXTURE APPLIED FINISH SYSTEM
TB	TACK BOARD
TKT	TICKET
TOB	TOP OF BEAM
TOM	TOP OF MASONRY
TOS	TOP OF STEEL
TOSS	TOP OF STUDS
TPO	THERMOPLASTIC POLYOLEFIN
TS	TUBE STEEL
TYP	TYPICAL
UGDL	UNDERGROUND DATA LINE
UGEL	UNDERGROUND ELECTRICAL LINE
UGTL	UNDERGROUND TELEPHONE LINE
UNO	UNLESS NOTED OTHERWISE
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VEST	VESTIBULE
VTR	VENT THRU ROOF
W	WIDTH
WD	WOOD
WDW	WINDOW
WGF	WOOD GYM FLOOR
WL	WATER LINE
WM	WATER METER
W/	WITH
W/O	WITHOUT

('E' IN FRONT OF ABBREVIATIONS INDICATES EXISTING)

INDEX

GENERAL

CIVIL

STRUCTURAL

ARCHITECTURAL

PLUMBING

MECHANICAL

ELECTRICAL

SYMBOLS LEGEND

BUILDING SECTION — SECTION / SECTION	ELEVATION TAG — ELEV	ROOM NAME AND NUMBER — ROOM (XXX)	RESTROOM ACCESSORY TAG — (X)
WALL SECTION — SECTION	ELEVATION HEIGHT — HEIGHT AFF	DOOR NUMBER — (XXX)	WALL FINISH TAG — X
DETAIL TAG — X / XXX	GRID LINE AND TAG — (X)	WINDOW TYPE — X	
		WALL TYPE — X	

LOCATION MAP
NOT TO SCALE

N

CONSULTANTS

SURVEY
PORTERFIELD SURVEYING, INC.
1306 N. Imo Rd.,
Enid, OK 73703
T. 580.233.0572

GEOTECHNICAL
BURGESS ENGINEERING AND TESTING
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PLUMBING/ MECHANICAL/ ELECTRICAL/
INTEGRATED CONSULTING ENGINEERS INC.
349 South Hydraulic
Wichita, KS 67211
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PROJECT DATA

Building Code Information

REFER CODE INFORMATION AND LIFE SAFETY SHEETS WITHIN THE GENERAL SHEETS INDEX

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08/11/2023

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

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LIFE SAFETY AND FIRE PROTECTION CODE COMPLIANCE

GENERAL PROJECT INFORMATION

PROJECT NAME	HENNESSEY PUBLIC SCHOOLS BUS BARN RENOVATION
PROJECT LOCATION	OK 51 & N. MITCHELL RD, HENNESSEY, OK 73742
PROJECT CONSTRUCTION PURPOSE	NEW CONSTRUCTION
BUILDING OWNER	HENNESSEY PUBLIC SCHOOLS
ESTIMATED PROJECT COST	1.4 MILLION
AUTHORITY HAVING JURISDICTION	TOWN OF HENNESSEY

PROJECT DESCRIPTION - SUMMARY:

ADDITION TO AN EXISTING METAL BUILDING STRUCTURE: EXISTING STRUCTURE SHALL BE CONSIDERED A LEVEL 1 ALTERATION AS THE EXISTING EGRESS PATH AND WALLS ARE NOT BEING MODIFIED EXCEPT FOR THE REMOVAL OF COMBUSTIBLE WOOD PARTITIONS AT THE EXISTING BUSINESS AREA. EXISTING EGRESS PATHS ARE MAINTAINED AND WILL EXIT THROUGH THE NEW ADDITION.
THE NEW ADDITION WILL CONSIST OF A METAL BUILDING STRUCTURE WITH STORAGE AND BUSINESS AREAS WHICH WILL MEET THE CURRENT IBC CODE STANDARDS FOR NEW CONSTRUCTION.

APPLICABLE DESIGN CRITERIA (CHECKED CODES APPLY TO THIS PROJECT)

	NAME:	EDITION:
STATE CODE ADOPTION :		
X	INTERNATIONAL BUILDING CODE (IBC)	2018
X	INTERNATIONAL EXISTING BUILDING CODE (IEBC)	2018
X	INTERNATIONAL FIRE CODE (IFC)	2018
X	INTERNATIONAL FUEL GAS CODE (IFGC)	2018
X	INTERNATIONAL MECHANICAL CODE (IMC)	2018
X	INTERNATIONAL PLUMBING CODE (IPC)	2018
X	NATIONAL ELECTRIC CODE (NEC)	2017
STATE CODE ADOPTION:		
X	FEMA 361: DESIGN AND CONSTRUCTION GUIDANCE FOR COMMUNITY SAFEROOMS	2015
X	ICC 500: STANDARD FOR THE DESIGN AND CONSTRUCTION OF STORM SHELTERS	2015
X	NFPA 1: FIRE CODE	2015
X	NFPA 13: STANDARD FOR THE INSTALLATION OF SPRINKLER SYSTEMS	2015
X	NFPA 24: STANDARD FOR THE INSTALLATION OF PRIVATE FIRE SERVICE MAINS	2013
X	NFPA 70: NATIONAL ELECTRIC CODE	2014
X	NFPA 72: NATIONAL FIRE ALARM AND SIGNALING CODE	2013
X	NFPA 220: STANDARD ON TYPE OF BUILDING CONSTRUCTION	2015
	INCLUDING MODIFICATIONS AND ADOPTIONS PER THE RULES OR THE OKLAHOMA UNIFORM BUILDING CODE COMMISSION	

BUILDING OCCUPANCY, CONSTRUCTION AND SEPARATION INFORMATION

USE AND OCCUPANCY CLASSIFICATION (IBC CHAPTER 3)

BUILDING NAME	IBC CLASSIFICATION	NFPA 101 CLASSIFICATION	AREA	OCC LOAD
BUS BARN	BUSINESS (B/S2)	BUSINESS (B/S2)	13,780 SQ FT	48

GENERAL BUILDING HEIGHTS AND AREA (IBC CHAPTER 5)

ALLOWABLE BUILDING HEIGHTS AND AREAS (IBC TABLE 503)

		TYPE IIB
GROUP B&S	HEIGHT (FT)	55'-0"
	S1 OR NS	NS
	STORIES	3 STORIES
	AREA	26,000 SF

AS-DESIGNED BUILDING HEIGHTS AND AREAS

		TYPE IIB
GROUP B&S	HEIGHT (FT)	20'-4"
	S1 OR NS	NS
	STORIES	1 STORIES
	AREA	13,780 SF

BUILDING AREA MODIFICATIONS (IBC, SECTION 506)

SECTION 506.1

BUILDING AREA MODIFICATIONS ARE NOT REQUIRED OR APPLICABLE SINCE THE PROJECT SCOPE OF WORK COMPLIES WITH THE ALLOWABLE BUILDING HEIGHT AND AREA FROM TABLE 503.

REQUIRED SEPARATION OF OCCUPANCIES (IBC, SECTION 508)

SECTION 508.4

SEPARATION OF OCCUPANCIES ARE NOT REQUIRED

TYPES OF CONSTRUCTION (IBC CHAPTER 6)

FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (IBC, TABLE 601)

BUILDING ELEMENT	RATING REQ'D	RATING PROVIDED	METHOD OF ACHIEVING RATING
PRIMARY STRUCTURAL FRAME	0 HR	0 HR	
EXTERIOR BEARING WALLS	0 HR	0 HR	
INTERIOR BEARING WALLS	0 HR	0 HR	
EXTERIOR NONBEARING WALLS	0 HR	0 HR	
INTERIOR NONBEARING WALLS	0 HR	0 HR	
FLOOR CONSTRUCTION	0 HR	0 HR	
ROOF CONSTRUCTION	0 HR	0 HR	

FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCE (IBC, TABLE 602)

FIRE SEPARATION DISTANCE= X (FEET)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP	FIRE RESISTANCE REQUIRED	FIRE RESISTANCE PROVIDED
X < 5	IIB	B	1 HR	2 HR

FIRE AND SMOKE PROTECTION FEATURES (IBC CHAPTER 7)

MAXIMUM AREA OF EXTERIOR WALL OPENINGS BASED ON FIRE SEPARATION DISTANCE AND DEGREE OF OPENING PROTECTION (IBC, TABLE 705.8)

FIRE SEPARATION DISTANCE (FEET)	DEGREE OF OPENING PROTECTION	ALLOWABLE AREA
30 OR GREATER	UNPROTECTED, NONSPRINKLERED	NO LIMIT

FIRE WALLS (IBC, SECTION 706)

FIRE SEPARATION DISTANCE (FEET)	DEGREE OF OPENING PROTECTION	ALLOWABLE AREA
30 OR GREATER	UNPROTECTED, NONSPRINKLERED	NO LIMIT

FIRE WALL FIRE-RESISTANCE RATINGS (IBC, SECTION 706.4)

GROUP	FIRE RESISTANCE RATING	CONSTRUCTION NOTES
B&S	N/A	NO FIRE WALL REQ'D FOR THIS PROJECT

FIRE-RESISTANCE RATING REQUIREMENTS FOR FIRE BARRIER ASSEMBLIES (IBC, SECTION 707.1)
BETWEEN FIRE AREAS (IBC, SECTION 707.3.9)

GROUP	FIRE RESISTANCE RATING	CONSTRUCTION NOTES
B&S	2FB	2FB WALL REQUIRED BETWEEN NEW ADDITION AND EXISTING BUILDING

SHAFT ENCLOSURES (IBC, SECTION 708; NFPA 101 8.6.5)

GROUP	FIRE RESISTANCE RATING	CONSTRUCTION NOTES
B&S	N/A	NO SHAFT WALL REQ'D FOR THIS PROJECT

OCCUPANCY LOAD, MEANS OF EGRESS AND PASSIVE FIRE PROTECTION

INTERIOR FINISHES (IBC CHAPTER 8)

INTERIOR WALL AND CEILING FINISH REQUIREMENTS BY OCCUPANCY (IBC, TABLE 803.9)

	SPRINKLERED			NONSPRINKLERED		
GROUP	EXITS	CORRIDORS	ROOMS	EXITS	CORRIDORS	ROOMS
B&S	CLASS B	CLASS C	CLASS C			

FIRE PROTECTION SYSTEMS (IBC CHAPTER 9)

AUTOMATIC SPRINKLER SYSTEMS (IBC, SECTION 903)

STATUS	AUTOMATIC SPRINKLER SYSTEM NOT PROVIDED
GROUP B&S	PER SECTION 903.2.3, AN AUTOMATIC SPRINKLER SYSTEM IS NOT REQUIRED

PORTABLE FIRE EXTINGUISHERS (IBC, SECTION 906)

FIRE EXTINGUISHERS FOR CLASS A FIRE HAZARDS (IBC, TABLE 906.3(1))

	MODERATE HAZARD OCC	EXTINGUISHERS AS PROVIDED
MIN. RATED SINGLE EXTINGUISHER	2-A	
MAX. FLOOR AREA PER UNIT OF A	1,500 SQ FT	13,780 SF / (6,000 SF = 10LB 4A) = 3 EXT MIN
MAX. FLOOR AREA FOR EXTINGUISHER	11,250 SQ FT	
MAX. TRAVEL DISTANCE TO EXTINGUISHER	75 FEET	

FIRE ALARM DETECTIONS SYSTEMS (IBC, SECTION 907.2.3)

GROUP B&S		
FIRE ALARM SYSTEM	MANUAL	NOT REQUIRED
SMOKE DETECTION SYSTEM	AUTOMATIC	REQUIRED
OCCUPANCY NOTIFICATION SYSTEM	AUTOMATIC	NOT REQUIRED
EXIT SIGNS		REQUIRED

MEANS OF EGRESS (IBC CHAPTER 10)

EGRESS WIDTH (IBC, SECTION 1005)

MINIMUM REQUIRED EGRESS WIDTH SHALL BE A TOTAL WIDTH OF MEANS OF EGRESS IN INCHES NOT LESS THAN THE TOTAL OCCUPANT LOAD SERVED BY THE MEANS OF EGRESS MULTIPLIED BY 0.2 INCHES PER OCCUPANT

MEANS OF EGRESS ILLUMINATION (IBC, SECTION 1006)

EMERGENCY LIGHTING	AUTOMATIC	REQUIRED

THE MEANS OF EGRESS, INCLUDING THE EXIT DISCHARGE, SHALL BE ILLUMINATED AT ALL TIMES THE BUILDING SPACE SERVED BY THE MEANS OF EGRESS IS OCCUPIED.

EXIT SIGNS (IBC, SECTION 1011)

EXIT SIGNS	AUTOMATIC	REQUIRED

EXITS AND EXIT ACCESS DOORS SHALL BE MARKED BY AN APPROVED EXIT SIGN READILY VISIBLE FROM ANY DIRECTION OF EGRESS TRAVEL.

PLUMBING SYSTEMS FEATURES

PLUMBING SYSTEMS (IBC CHAPTER 29)

REQUIRED								
		WATER CLOSETS		LAVATORIES			DRINKING	OTHER
CLASSIFICATION	OCCUPANCY	MALE	FEMALE	MALE	FEMALE		FOUNTAIN	
B&S	48	(1 PER 25 1ST 50)		(1 PER 40 1ST 80)			(1 PER 100)	1 SERVICE SINK
REQ'D TOTALS		1		1			1	1
PROVIDED		2		2			1	1

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CODE INFORMATION

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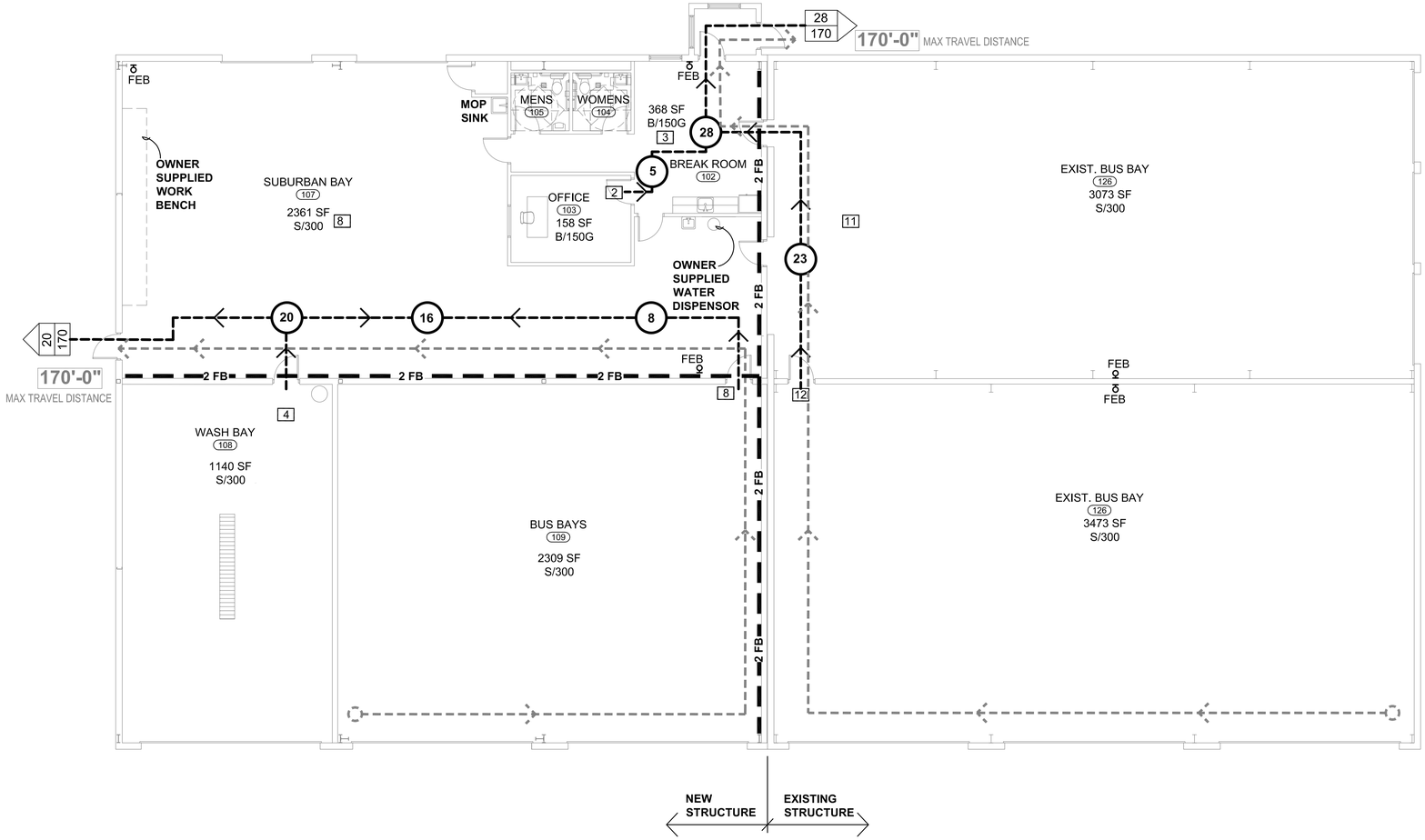
G0.101



1 LIFE SAFETY PLAN
G0.201 SCALE: 1/8" = 1'-0"

NORTH

LIFE SAFETY PLAN LEGEND

FEC - FIRE EXTINGUISHER AND CABINET (SEMI-RECESSED)

FEB - FIRE EXTINGUISHER AND BRACKET

EMERGENCY & EXIT LIGHTS - SEE SHEET E1.201

FACP & DEVICES - SEE SHEET E1.301

FUNCTION OF SPACE

B = BUSINESS
E = CLASSROOM (EDUCATION)
EX = EXERCISE ROOMS
S = STORAGE
UA = UNCONCENTRATED ASSEMBLY
CA = CONCENTRATED ASSEMBLY
FA = FIXED SEATING ASSEMBLY

WITHIN THE STORM SHELTER OWNER TO PROVIDE FIRST AID KIT PER ICC 500-14 SECTION 702.4

########## ROOM AREA
FUNCTION — E @ 20N — MAX FLOOR AREA ALLOWANCE PER OCCUPANT PER TABLE 1004.1.1
PER TABLE 1004.1.2
38 OCCUPANT LOAD

2 TOTAL OCCUPANT LOAD OF ROOM

18 TOTAL OCCUPANT LOAD ALONG PATH

1 / 340 TOTAL OCCUPANT LOAD AT EXIT, REF. PLAN

TOTAL EGRESS CAPACITY OF EXIT - 34" CLEAR DOOR TYP.

30" x 48" CLEAR FLOOR SPACE

2 FB — 2 HOUR FIRE BARRIER PER THE REQUIREMENTS OF ASTM E119

EXIT LIGHT

MAX TRAVEL DISTANCE

XX'-X" DISTANCE FROM MOST FURTHEST OCCUPANT TRAVEL AREA

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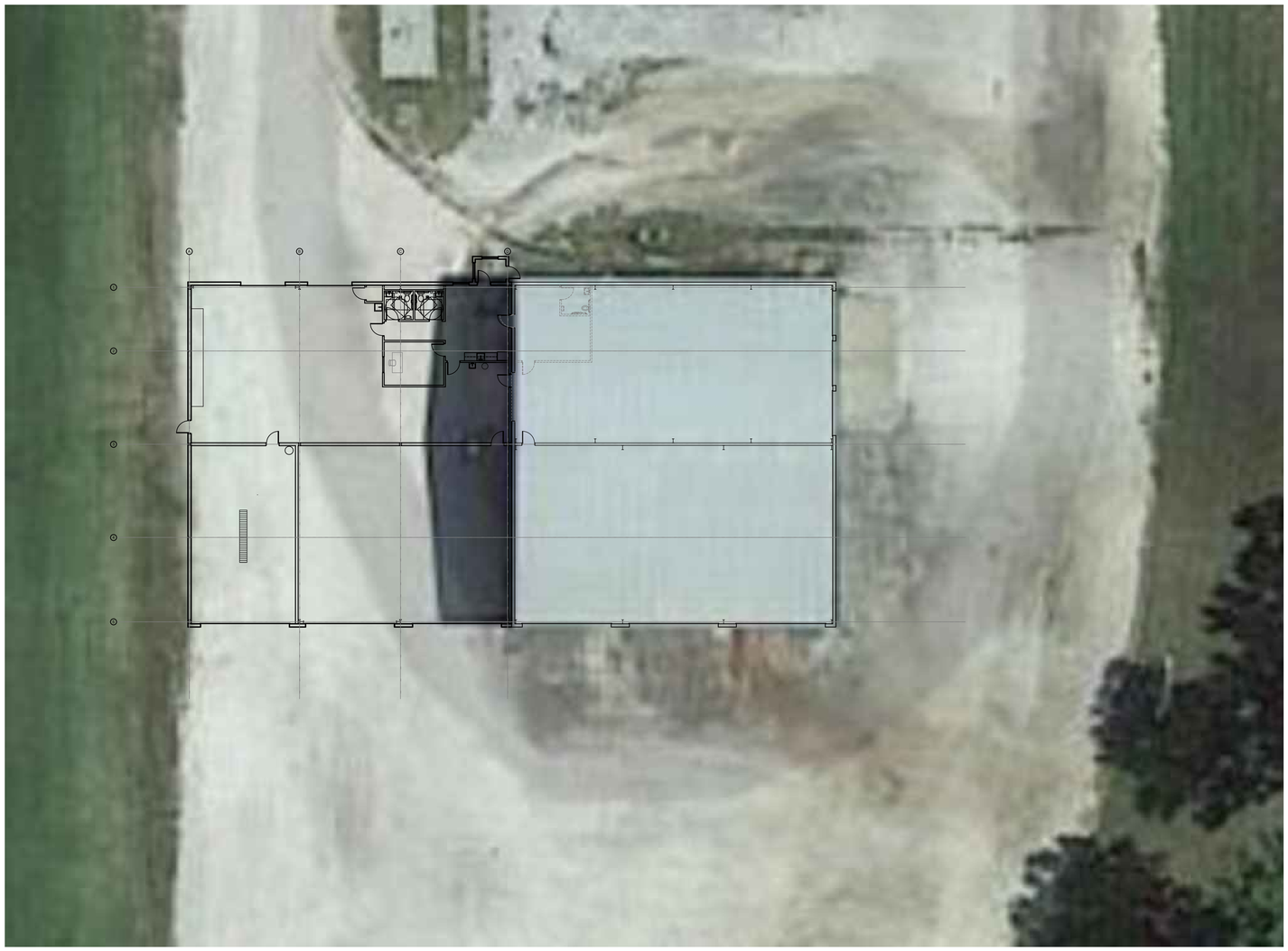

A OVERALL LIFE SAFETY PLAN
SCALE: 1/16" = 1'-0"

NORTH

BUILDING "A"
NEW CONSTRUCTION THAT WILL COMMENCE AFTER THE ALTERATION OF BUILDING "B"

BUILDING "A"
SHOWN FOR FUTURE REFERENCE AND WILL BE PERMITTED AT A LATER DATE

BUILDING "B"
EXISTING ALTERATION CONSISTING OF DEMOLITION & INTERIOR FINISH IMPROVEMENTS. EXISTING PARTITIONS & EGRESS SYSTEM WILL NOT BE MODIFIED.

BUILDING "B"
EXISTING BUILDING
REFER G0.202 FOR LIFE SAFETY PLAN

BLDG. "A" = 19,039 S.F.
SPRINKLED FUTURE NEW BUILDING

BLDG. "B" = 6,641 S.F.
NON SPRINKLED EXISTING BUILDING

B AREA PLANS
SCALE: 1/32" = 1'-0"

NORTH

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Date: Aug 10, 2023, 11:22am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\G0.203 - Overall Life Safety Plan.dwg

GENERAL NOTES

1. PLANS, SECTIONS, ELEVATIONS, DETAILS AND OTHER DRAWINGS ARE NOT TO BE SCALED FOR DETERMINATION OF QUANTITIES, LENGTHS OR FIT OF MATERIALS.

2. ALL WORK SHALL CONFORM TO ALL APPLICABLE BUILDING CODES, ORDINANCES, AND REGULATIONS AS ADOPTED BY LOCAL AUTHORITIES HAVING JURISDICTION.

3. THIS SET OF DOCUMENTS IS PRESENTED IN TWO (2) PACKAGES: DRAWINGS AND SPECIFICATIONS.

4. THE PROJECT MANUAL CONTAINS BOTH DRAWINGS AND SPECIFICATIONS.

5. THE SPECIFICATIONS AND ALL CONSULTANT DRAWINGS ARE SUPPLEMENTAL TO THE ARCHITECTURAL DRAWINGS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH THE ARCHITECTURAL DRAWINGS BEFORE THE INSTALLATION OF ANY OF THE CONSULTANTS WORK AND TO BRING ANY DISCREPANCIES OR CONFLICTS TO THE ARCHITECTS ATTENTION FOR CLARIFICATION. IMPROPERLY INSTALLED WORK SHALL BE CORRECTED BY THE GENERAL CONTRACTOR AT HIS EXPENSE AND AT NO EXPENSE TO THE ARCHITECT, HIS CONSULTANTS OR THE OWNER.

6. STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING, CIVIL, AND LANDSCAPE DRAWINGS ARE SUPPLEMENTAL TO THE ARCHITECTURAL DRAWINGS. THE CONTRACTOR SHALL REVIEW ALL PLANS AND DRAWINGS. IN THE EVENT OF CONFLICTING STATEMENTS, INSUFFICIENT INFORMATION, OR ERRORS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ARCHITECT AND OBTAIN CLARIFICATION BEFORE ANY WORK IS BEGUN. WORK INSTALLED WHERE CONFLICTING CONDITIONS EXIST SHALL BE CORRECTED AT CONTRACTOR'S EXPENSE.

7. THE ARCH DWGS ARE A PART OF A LARGER SET OF DRAWINGS WHICH, WHEN COMPLETE, CONSISTS OF ALL DRAWINGS LISTED BY THE INDEX OF DWGS. THE WORK DESCRIBED BY THE DWGS OF ANY ONE DISCIPLINE MAY BE AFFECTED BY THE WORK DESCRIBED ON DWGS OF ANOTHER DISCIPLINE AND MAY REQUIRE REFERENCE TO DWGS OF ANOTHER DISCIPLINE. PARTIAL SETS OF DWGS ARE INCOMPLETE AND SHALL NOT BE DISTRIBUTED AND UTILIZED BY THE CONTRACTOR. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REVIEW AND COORDINATE THE WORK OF ALL SUBCONTRACTORS, TRADES, AND SUPPLIERS WITH THE REQUIREMENTS OF THE CONTRACT BEFORE COMMENCING CONSTRUCTION, AND TO ASSURE THAT ALL PARTIES ARE AWARE OF ALL REQUIREMENTS, REGARDLESS OF WHERE THE REQUIREMENTS OCCUR IN THE CONTRACT DOCUMENTS.

8. THESE DRAWINGS AND SPECIFICATIONS INDICATE THE GENERAL SCOPE OF THE PROJECT IN TERMS OF ARCHITECTURAL DESIGN CONCEPT, MAJOR ARCHITECTURAL ELEMENTS AS WELL AS SIZE AND LOCATION OF THOSE ELEMENTS. THE DRAWINGS AND SPECIFICATIONS DO NOT NECESSARILY INDICATE OR DESCRIBE ALL WORK REQUIRED FOR FULL PERFORMANCE AND COMPLETION OF THE REQUIREMENTS OF THE CONTRACT DOCUMENTS. ON THE BASIS OF THE GENERAL SCOPE INDICATED OR DESCRIBED, THE CONTRACTOR SHALL FURNISH ALL ITEMS REQUIRED FOR ACCEPTABLE EXECUTION OF WORK.

9. DIMENSIONS, DETAILS, NOTES, AND/OR SYMBOLS THAT APPLY TO ONE UNIT, APPLY TO ALL UNITS IN LIKE SITUATIONS UNLESS NOTED OTHERWISE.

10. ALL ITEMS WITHIN THESE PROJECT DOCUMENTS ARE PART OF THE BASE BID UNLESS OTHERWISE NOTED.

11. DETAILS NOTED AS 'TYPICAL' SHALL APPLY IN ALL LIKE CONDITIONS UNLESS SPECIFICALLY SHOWN OR NOTED OTHERWISE. WHERE NO SPECIFIC DETAIL IS SHOWN, THE FRAMING OR CONSTRUCTION SHALL BE IDENTICAL OR SIMILAR TO THAT INDICATED FOR LIKE CASES OF CONSTRUCTION IN THIS PROJECT.

12. THE ARCH DWGS ESTABLISH AND COORDINATE THE FINISHED APPEARANCE AND EXACT LOCATION OF ALL EXPOSED ELEMENTS OF THE WORK, INCLUDING THAT WORK WHICH IS ILLUSTRATED PRIMARILY ON DWGS OF OTHER DISCIPLINES. LOCATIONS SHOWN ON OTHER DWGS ARE SCHEMATIC, UNLESS OTHERWISE NOTED ON THE ARCH DWGS. THE ARCH DWGS TAKE PRECEDENCE FOR THE FINISHED APPEARANCE AND EXACT LOCATION OF ALL PARTS OF THE WORK.

13. EXCEPTION: DIMENSIONED LOCATIONS SHOWN ON DRAWINGS OF OTHER DISCIPLINES SHALL GOVERN ONLY WHERE:

A. SPECIFICALLY AND INDIVIDUALLY INDICATED BY SYMBOL, KEYED NOTE, OR NOTATION ON THE ARCHITECTURAL DRAWINGS.

B. OCCURRING WITHIN A ROOM OR OTHER IDENTIFIED SPACE FOR WHICH ARCH SHEET OR SCHEDULE NOTES INDICATE THAT DIMENSIONS PROVIDED ELSEWHERE SHALL GOVERN

14. WHENEVER AN ARTICLE, DEVICE, OR PIECE OF EQUIPMENT IS SHOWN, INDICATED, OR REFERRED TO ON THE DRAWINGS OR IN THESE NOTES IN THE SINGULAR NUMBER, SUCH REFERENCES APPLY TO AS MANY SUCH ARTICLES AS ARE REQUIRED TO COMPLETE THE INSTALLATION.

15. THE GENERAL CONTRACTOR AND ALL SUBCONTRACTORS SHALL REVIEW, COORDINATE REQUIREMENTS OF THE DRAWINGS AND VERIFY ALL DIMENSIONS AND CONDITIONS BEFORE BEGINNING FABRICATION OR INSTALLATION OF THE WORK. CONTRACTOR SHALL REPORT DISCREPANCIES OR CONFLICTS IN WRITING TO ARCHITECT FOR RESOLUTION.

16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MEANS, METHODS, TECHNIQUES AND PROCEDURES EMPLOYED IN THE PERFORMANCE OF WORK IN, ON, OR ABOUT THE JOB SITE; THE CONTRACTOR SHALL COORDINATE AND VERIFY ALL WORK PERFORMED BY SUBCONTRACTORS.
   A. CONTRACTOR TO ENSURE SPECIAL INSPECTIONS ARE PREFORMED IN COMPLIANCE WITH CODE. REFER TO PROJECT MANUAL SECTION 01450 FOR ADDITIONAL INFORMATION.

17. ALL CONTRACTORS AND SUBCONTRACTORS PERFORMING WORK ON, OR RELATED TO THIS PROJECT SHALL CONDUCT THEIR OPERATIONS SO THAT ALL EMPLOYEES ARE PROVIDED A SAFE PLACE TO WORK AND THE PUBLIC IS PROTECTED, AND SHALL COMPLY WITH THE "OCCUPATIONAL SAFETY AND HEALTH ACT" OF THE U.S. DEPARTMENT OF LABOR AND WITH ANY AND ALL OTHER APPLICABLE STATE AND/OR LOCAL SAFETY REGULATIONS. THE CONTRACTOR AGREES TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE SAFETY CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD HARMLESS THE OWNER AND ARCHITECT FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH PERFORMANCE OF WORK ON THIS PROJECT.

18. THE STRUCTURE IS DESIGNED AS A STABLE UNIT AFTER ALL COMPONENTS ARE IN PLACE. THE CONTRACTOR SHALL PROVIDE ALL SHORING AND BRACING NECESSARY TO ENSURE THE STABILITY OF ANY AND ALL PARTS OF THE BUILDING DURING CONSTRUCTION.

19. CONTRACTOR SHALL COORDINATE THE INSTALLATION OF THE VARIOUS TRADE ITEMS WITHIN THE SPACE ABOVE THE CEILINGS (INCLUDING BUT NOT LIMITED TO: STRUCTURAL MEMBERS AND FIREPROOFING, MECHANICAL DUCTS AND INSULATION, CONDUITS, RACEWAYS, SPRINKLER SYSTEMS, LIGHT FIXTURES, CEILING SYSTEMS, AND ANY SPECIAL STRUCTURAL SUPPORTS REQUIRED) AND SHALL BE RESPONSIBLE FOR MAINTAINING THE FINISH CEILING HEIGHT ABOVE THE FINISH FLOOR INDICATED IN THE DRAWINGS AND THE FINISH SCHEDULE.

20. UNLESS SPECIFICALLY SHOWN OR NOTED ON THE DRAWINGS, NO STRUCTURAL MEMBER SHALL BE CUT, NOTCHED, BORED, OR OTHERWISE MODIFIED WITHOUT PERMISSION OF THE ARCHITECT.

21. WHETHER OR NOT DETAILED ON DRAWINGS, THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL STIFFENERS, BRACING, BACK-UP PLATES, AND SUPPORTING BRACKETS REQUIRED FOR THE INSTALLATION OF ALL CASEWORK AND OF ALL WALL-MOUNTED OR SUSPENDED MECHANICAL, ELECTRICAL, OR MISCELLANEOUS EQUIPMENT, INCLUDING PLYWOOD BACKBOARDS FOR TELEPHONE AND ELECTRICAL EQUIPMENT ROOMS.

22. PROVIDED FIRESTOPPING IN ACCORDANCE WITH UNDERWRITER'S LABORATORIES DESIGNS AT PENETRATIONS IN NEW WALL OR FLOOR ASSEMBLIES THAT ARE DESIGNATED AS RATED SMOKE OR FIRE BARRIERS OR WHERE UN-RATED WALL OR FLOORS ARE SPECIFICALLY NOTED TO BE SEALED. AT RATED WALLS THE FIRESTOPPING SHALL BE IN COMPLIANCE WITH STANDARDS REQUIRED BY UNDERWRITER'S LABORATORIES.

23. WHEN PENETRATING EXISTING FLOOR AND WALL ASSEMBLIES, CONTRACTOR SHALL CONFER WITH BUILDING OFFICIAL TO DETERMINE TYPE OF FIRESTOPPING REQUIRED.

24. NEITHER THE ARCHITECT'S REVIEW NOR APPROVAL OF SHOP DRAWINGS SHALL RELIEVE THE GENERAL CONTRACTOR FROM RESPONSIBILITY FOR DEVIATIONS FROM DRAWINGS OR SPECIFICATIONS UNLESS HE HAS CALLED THE ARCHITECTS ATTENTION (IN WRITING) TO SUCH DEVIATIONS AT THE TIME OF SUBMISSION, NOR SHALL IT RELIEVE HIM OF RESPONSIBILITY FOR ERRORS OF ANY SORT IN THE SHOP DRAWINGS.

25. PROVIDE FIRE EXTINGUISHERS, AS SHOWN ON DRAWINGS, WITH A RATING OF NOT LESS THAN 2A WITHIN 75 FOOT TRAVEL DISTANCE TO ALL PORTIONS OF THE BUILDING. PROVIDE A PORTABLE FIRE EXTINGUISHER WITH A RATING OF NOT LESS THAN 10BC FOR MECHANICAL AND ELECTRICAL EQUIPMENT ROOMS. PROVIDE PORTABLE FIRE EXTINGUISHERS AS THE BUILDING IS CONSTRUCTED, WHERE NOT SHOWN ON THE PLANS. FINAL LOCATIONS OF ALL FIRE EXTINGUISHERS SHALL BE APPROVED BY THE ARCHITECT PRIOR TO SUBMITTAL TO THE FIRE MARSHAL, AND PRIOR TO INSTALLATION.

26. INSTALLATION OF GLASS SHALL CONFORM TO FEDERAL SPECIFICATION 16-CFR-1202 AND ALL LOCAL CODES AND ORDINANCES. GLASS SUBJECT TO HUMAN IMPACT SHALL COMPLY WITH U.S. CONSUMER PRODUCT SAFETY STANDARDS. CERTIFICATE SHALL ACCOMPANY PRODUCT STATING DATE AND PLACE OF MANUFACTURE.

27. REFER TO THE CIVIL ENGINEER'S DRAWINGS FOR LOCATIONS OF EXISTING UTILITY LINES. LOCATIONS OF ALL UTILITIES SHOWN ARE APPROXIMATE AND THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION IN EXCAVATION AND TRENCHING TO AVOID INTERCEPTING EXISTING PIPING OR CONDUITS.

28. LOCATE UTILITIES BEFORE ANY SITE WORK IS BEGUN. CALL UTILITY COMPANIES, CITY UTILITY DEPARTMENTS AND OWNER'S MAINTENANCE CHIEF FOR ASSISTANCE IN LOCATIONS, (IN OKC, CALL "OKIE")

29. THE CONTRACTOR IS RESPONSIBLE TO VERIFY LOCATION OF ALL SITE UTILITIES AND TO COORDINATE AND AVOID CONFLICT IN THE LOCATIONS OF NEW UNDERGROUND AND SITE UTILITIES. THE CONTRACTOR SHALL INCLUDE ALL NECESSARY FEES, METERS, AND CONNECTIONS IN HIS BID.

30. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER AND THE ARCHITECT SHOULD UNIDENTIFIED FIELD CONDITIONS BE DISCOVERED.

31. ALL AREAS OF THIS SITE, EXTERIOR AND INTERIOR, WHICH ARE NOT IN THE SCOPE OF THE PROJECT AND ARE DISTURBED BY CONSTRUCTION SHALL BE RETURNED TO ORIGINAL CONDITION.

32. ALL UNDERGROUND UTILITIES OR STRUCTURES REPORTED BY THE OWNER OR OTHERS, & THOSE SHOWN ON THE RECORDS EXAMINED, ARE INDICATED W/ THEIR APPROXIMATE LOCATION AND EXTENT. THE OWNER BY ACCEPTING THESE PLANS OR PROCEEDING WITH IMPROVEMENTS PURSUANT THERETO, AGREES TO ASSUME LIABILITY AND TO HOLD RENAISSANCE ARCHITECTS HARMLESS FOR ANY DAMAGES RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED BY RENAISSANCE ARCHITECTS, NOT INDICATED ON THE RECORDS EXAMINED, LOCATED AT VARIANCE W/ THOSE REPORTED, OR SHOWN ON RECORDS EXAMINED. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES FOUND AT THE SITE. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO NOTIFY THE OWNER(S) OF THE UTILITIES OR STRUCTURES CONCERNED BEFORE STARTING WORK.

33. ALL EARTH SUB-BASE TO RECEIVE NEW WORK SHALL BE COMPACTED TO 95% PROCTOR DENSITY, UNLESS SPECIFIED OTHERWISE.

34. ALL FILL SHALL BE APPROVED NON-EXPANSIVE MATERIAL.

35. FLOOR SLABS ON GRADE SHALL BE PLACED BY THE CHECKERBOARD METHOD WITH KEYED JOINTS AT 24' CENTERS EACH WAY, AND 2' SQUARES AT COLUMNS.

36. ALL SURFACES THAT ENCLOSE THE BUILDING EXCEPT GLAZING SHALL BE INSULATED IN ACCORD WITH THE FOLLOWING UNLESS OTHERWISE NOTED:

	THICKNESS	R-FACTOR	TYPE
EXTERIOR WALLS & SURFACES	6"	19	BATTS
ROOF SURFACES	6" MIN.	19	BATTS
	2" MIN.	6	BATTS
GRADE BEAMS & SLABS	15" MIN.	7	POLYSTYRENE

37. GROUT SOLID ALL CELLS OF CONCRETE BLOCK WALLS RECEIVING MOUNTED ELECTRICAL PANELS, ANCHORAGE OF SUCH ITEMS AS LADDERS, HANDRAILS, EQUIPMENT STANDARDS OR ANCHORAGES, ETC.

38. EXTERIOR SURFACES, ALL JOINTS, CONSTRUCTION JOINTS, AND JOINTS BETWEEN DIFFERENT MATERIALS SHALL BE CAULKED WITH SEALANT.

PARTITIONS

39. UNLESS INDICATED OTHERWISE, ALL NON-LOADING METAL STUD WALLS PARTITIONS AND FURRING SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING:

	SIZE	SPACING
EXTERIOR WALLS	6" X 20 GA	24" O.C.
INTERIOR PARTITIONS	3-5/8" X 25 GA	24" O.C.
FURRED SURFACES	7/8" FURR CHANNEL	24" O.C.

40. FINISH FLOOR ELEVATIONS SHOWN AT TYPICAL FLOORS INDICATE THE TOP OF THE CONCRETE SLABS WHERE EXPOSED, FINISHED WITH CARPET, THIN SET CERAMIC TILE, OR VINYL COMPOSITION TILE, UNLESS OTHERWISE NOTED. FINISH FLOOR ELEVATION SHOWN AT 100'-0" LEVEL IDENTIFIES TO THE TOP OF STONE, TERRAZZO, CARPET OR EXPOSED CONCRETE. EXISTING SLAB ELEVATIONS MUST BE FIELD VERIFIED, GENERAL CONTRACTOR SHALL USE CEMENT UNDERLAYMENT TO MAINTAIN ELEVATIONS INDICATED ON CONTRACT DOCUMENTS.

41. CONTRACTOR SHALL VERIFY ALL COLUMN COORDINATES AND CHECK THEM AGAINST DIMENSIONS SHOWN ON PLANS AND DETAILS. ARCHITECT SHOULD BE NOTIFIED OF ANY DISCREPANCY DURING STAKING.

42. PROVIDE AND INSTALL HEAVIER GAUGE STUDS, STIFFENERS, BRACING, BACK-UP PLATES, ETC., AS REQUIRED AT STUD WALLS FOR SUPPORT OF TOILET ROOM FIXTURES OR OTHER EQUIPMENT.

43. SEE WALL LEGENDS OR CALLOUTS ON PLANS FOR GYPSUM BOARD THICKNESS AND FIRE RATING AND FOR INSULATION AS REQUIRED.

44. ALL GYPSUM BOARD USED IN JANITOR'S ROOMS AND TOILET ROOMS SHALL BE WATER RESISTANT.

45. FILL-IN TIGHT AROUND ALL PIPES, DUCTS, CONDUIT AND OTHER ITEMS THAT PENETRATE FLOORS, WALLS AND PARTITIONS.

A. PATCHES, INCLUDING SUBSTRATE SUPPORTS, SHALL BE EQUAL TO EXISTING MATERIAL FOR NON-RATED WALLS AND PARTITIONS.

B. USE APPROVED FIRESTOPPING MATERIALS AND METHODS IN FLOORS AND IN FIRE AND SMOKE RATED WALLS AND PARTITIONS.

46. FURR-IN ALL COLUMNS, PIPES, CONDUITS AND OTHER ITEMS THAT CANNOT BE CONTAINED WITH WALL CAVITIES. COORDINATE WITH ALL TRADES FOR LOCATIONS AND SIZES REQUIRED.

47. WHERE DIFFERENT FLOOR MATERIALS MEET , TAPER UNDERLAYMENT TO MATCH LEVELS OF FLOOR FINISHES.

48. ALL DIMENSIONS LOCATING STUD WALLS, CMU WALLS AND PARTITIONS ARE TO FACE OF GYPSUM WALLBOARD, SHEATHING OR FINISH MATERIAL UNLESS OTHERWISE INDICATED.

49. ALL SMALL SCALE MASONRY DIMENSIONS ARE NOMINAL AND ALL LARGE SCALE MASONRY DIMENSIONS ARE ACTUAL.

DOORS & WINDOWS

50. AIR LEAKAGE AT EXTERIOR DOORS SHALL BE LIMITED BY THE FOLLOWING:

A. ALL DOORS SHALL BE PROVIDED WITH A SEAL, ASTRAGAL OR BAFFLE AT THE HEAD AND SILL.

B. DOOR JAMBS MOUNTED ON EITHER THE INSIDE OR OUTSIDE OF AN EXTERIOR WALL SHALL LAP THE ADJACENT WALL CONSTRUCTION A MINIMUM OF ONE INCH.

C. DOORS REQUIRING VERTICAL TRACK GUIDES SHALL USE A CONTINUOUS MOUNTING ANGLE, SEALED IN ACCORDANCE WITH ITEM 1.G BELOW.

D. DOORS MOUNTED BETWEEN JAMBS SHALL HAVE A CONTINUOUS SEAL OR BAFFLE AT EACH JAMB.

E. MEETING RAILS OF SECTIONAL DOORS AND MEETING STILES OR RAILS OF BIPARTING DOORS SHALL BE PROVIDED WITH A SEAL, ASTRAGAL, OR BAFFLE.

F. SWINGING AND REVOLVING DOORS SHALL BE WEATHER-STRIPPED AT THE HEAD, SILL, AND JAMB.

G. OPEN EXTERIOR JOINTS AROUND WINDOW AND DOOR FRAMES, BETWEEN WALLS AND FOUNDATIONS, PENETRATIONS OF UTILITY SERVICES THROUGH WALLS AND FLOORS, AND ALL OTHER OPENINGS IN THE EXTERIOR ENVELOPE SHALL BE SEALED, CAULKED, GASKETED, OR WEATHER-STRIPPED TO LIMIT AIR LEAKAGE.

STAIRS, EXITS, AND OCCUPANT LOADS

51. REQUIRED EXIT DOORS:

A. SHALL BE OPENABLE FROM INSIDE WITHOUT USE OF A KEY OR ANY SPECIAL KNOWLEDGE OR EFFORT.

B. ALL EXIT DOORS MUST OPEN OVER A LANDING NOT MORE THAN 1/2" BELOW THRESHOLD PER BUILDING CODE.

C. ALL EXIT DOORS SHALL SWING IN THE DIRECTION OF EXIT TRAVEL WHEN SERVING MORE THAN 50 OCCUPANTS PER BUILDING CODE.

D. PANIC HARDWARE SHALL BE PROVIDED ON EXIT DOORS SERVING ROOMS, CORRIDORS, OR STAIRWAYS HANDLING AN OCCUPANT LOAD OF 50 OR MORE PERSONS.

E. DOORS SHALL BE NOT LESS THAN 3'-0" W X 6'-8" H WITH NO SINGLE LEAF EXCEEDING 4'-0" IN WIDTH.

52. DOORS AND DOORWAYS: THE FLOOR ADJACENT TO A DOORWAY SHALL BE LEVEL FOR A DISTANCE OF FIVE FEET FROM THE DOOR IN THE DIRECTION OF DOOR SWING AND SHALL BE NOT LESS THAN 5' WIDE.

53. ALL REQUIRED EXITS SHALL HAVE EXIT SIGNS AND ALL BLIND CORRIDOR TURNS SHALL HAVE DIRECTIONAL EXIT SIGNS WITH A PRINCIPAL STROKE NOT LESS THAN 3/4" WIDE AND 6" HIGH.

FIRE-RATED WALLS & PARTITIONS

54. ALL WOOD WITHIN THIS PROJECT (I.E. PLYWOOD, BLOCKING, ETC.) SHALL BE FIRE TREATED.

55. WALLS AND PARTITIONS INDICATED TO HAVE FIRE RESISTANCE RATINGS SHALL COMPLY WITH THE UL DESIGNS SCHEDULED UNDER "BUILDING CODE INFORMATION".

56. CONSTRUCT FIRE-RATED WALLS AND PARTITIONS CONTINUOUS FROM OUTSIDE WALL TO OUTSIDE WALL, FROM FLOOR SLAB TO FLOOR OR ROOF DECK ABOVE, FROM FIRE-RATED PARTITION TO FIRE-RATED PARTITION, OR ANY COMBINATION THEREOF.

57. INSTALL GYPSUM BOARD PANELS ON FIRE-RATED PARTITIONS PRIOR TO INSTALLING GYPSUM BOARD PANELS ON INTERSECTING OR ABUTTING NON-RATED PARTITIONS.

58. SEAL ALL HOLES, OPENINGS, GAPS AND PENETRATIONS WITH AN APPROVED SEALANT CAPABLE OF MAINTAINING THE FIRE RESISTANCE OF THE BARRIER.

ARCHITECTURALLY FINISHED STEEL NOTES

59. ALL EXPOSED STEEL, INCLUDING BUT NOT LIMITED TO BEAMS, DECKS & MISC. STEEL, TO BE HOT DIPPED GALVANIZED, FREE OF BURRS, SURFACE IMPERFECTIONS, & MILL STAMPS.

60. ALL FASTENERS TO MATCH STEEL FINISH.

61. ALL SHARP CORNERS, JOINTS, WELDS & IMPERFECTIONS TO BE GROUND SMOOTH.

62. ANY DISTURBED GALVANIZATION TO BE TOUCHED UP / PAINTED WITH GALVANIZED PAINT.

63. ARCHITECT TO VISUALLY OBSERVE AND APPROVE ALL EXPOSED STEEL STRUCTURES PRIOR TO APPLICATION OF FINISH COAT OF PAINT.

MECHANICAL, PLUMBING AND ELECTRICAL

64. MAXIMUM SIZE OF INDIVIDUAL ELECTRICAL OUTLET AND SWITCH BOXES SHALL NOT EXCEED 16 SQUARE INCHES IN SURFACE AREA.

65. PROVIDE AND LOCATE, AFTER APPROVAL BY ARCHITECT, ACCESS DOORS OR PANELS IN CEILING AND WALL CONSTRUCTION AS REQUIRED BY INSTALLATION OF MECHANICAL, PLUMBING, AND ELECTRICAL WORK IN ADDITION TO THOSE SHOWN ON THE DRAWINGS.

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08/11/2023

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

SHEET TITLE:
GENERAL NOTES

DATE: 08-10-2023

SHEET NUMBER
G0.301

66. INSTALL BOXES SO THAT THE AGGREGATE SURFACE AREA OF ALL BOXES DOES NOT EXCEED 100 SQUARE INCHES PER 100 SQUARE FEET OF WALL SURFACE.

67. CONTRACTOR SHALL VERIFY SIZE AND LOCATIONS OF ALL MECHANICAL EQUIPMENT PLATFORMS AND BASES AS WELL AS POWER AND WATER OR DRAIN INSTALLATIONS WITH EQUIPMENT MANUFACTURERS PRIOR TO PROCEEDING WITH THE WORK. CHANGES TO ACCOMMODATE FIELD CONDITIONS OR CONTRACTORS SUBSTITUTIONS SHALL BE MADE WITHOUT ADDITIONAL CHARGE TO OWNER.

68. INSTALL BOXES LOCATED ON OPPOSITE FACES OF WALLS AND PARTITIONS WITH A HORIZONTAL SEPARATION OF NOT LESS THAN 24".

69. MECHANICAL AND ELECTRICAL CONTRACTORS SHALL VERIFY SIZE, SHAPE, AND LOCATION OF HOUSEKEEPING PADS FOR THEIR EQUIPMENT. ANY FIELD CHANGES SHALL BE MADE WITHOUT ADDITIONAL CHARGE TO THE OWNER.

70. IN STUD WALLS AND PARTITIONS, SECURE BOXES TO STUDS AND CUT OPENINGS IN WALLBOARD SO THAT CLEARANCE BETWEEN BOX AND WALLBOARD IS NO LARGER THAN 1/8-INCH.

71. WHERE RESTROOMS ARE PROVIDED, MECHANICAL VENTILATION SHALL BE PROVIDED TO ENSURE AN AIR CHANGE EACH FIVE MINUTES.

72. 3/4" FIRE TREATED PLYWOOD BACKING 8'-0" HIGH SHALL BE PROVIDED AND INSTALLED AT TELEPHONE AND ELECTRICAL ROOMS AS REQUIRED. SEE ELECTRICAL PLANS FOR EQUIPMENT LOCATIONS.

73. INSTALL DOWNSPOUTS & ROOF DRAIN PIPING CONNECTED TO BELOW GRADE STORM LINES SO THAT LINES PENETRATING FOOTINGS ARE SLEEVED AS REQUIRED BY CODE, REGULATIONS, OR INSTALLATION OF PIPING AND FOOTING.

74. RETURN AIR IS THROUGH DUCTED SYSTEM. RETURN AIR PLENUMS ARE NOT UTILIZED.

75. PERFORM FINAL ADJUSTMENT OF ALL FIRE SPRINKLER HEADS AFTER CEILINGS ARE IN PLACE AND IMMEDIATELY PRIOR TO SUBSTANTIAL COMPLETION.

SAFETY NOTES

76. THE CONTRACTOR SHALL BE RESPONSIBLE FOR JOB SITE SAFETY. THE FOLLOWING REQUIREMENTS ARE NOT INTENDED TO BE A COMPLETE LIST, BUT ARE ADDITIONAL SAFETY REQUIREMENTS FOR THE CONTRACTOR. OBSERVATION VISITS TO THE SITE BY THE ARCHITECT SHALL NOT INCLUDE INSPECTION OF THE FOLLOWING ITEMS.

A. THE CONTRACT DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE DESIGN, ADEQUACY AND SAFETY OF ERECTION BRACING, SHORING, TEMPORARY SUPPORTS, ETC., IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR, AND HAS NOT BEEN CONSIDERED BY THE ARCHITECT. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE STRUCTURE PRIOR TO THE APPLICATION OF ALL WALLS AND ROOF AND FLOOR SHEATHING. THE CONTRACTOR SHALL PROVIDE THE NECESSARY BRACING TO PROVIDE STABILITY PRIOR TO THE APPLICATION OF THE AFOREMENTIONED MATERIALS.

B. AN ERECTION PLAN IS REQUIRED FOR MOST CONSTRUCTION PHASES. CONTRACTOR SHALL DETERMINE ALL CONSTRUCTION PHASES WHICH REQUIRE ERECTION PLANS ACCORDING TO ALL APPLICABLE SAFETY REGULATIONS. A CERTIFIED COPY OF SUCH ERECTION PLANS SHALL REMAIN ON THE CONSTRUCTION SITE AT ALL TIMES.

C. TEMPORARY LOADING DURING CONSTRUCTION SHALL NOT OVERLOAD DESIGN VALUES. CONTRACTOR IS RESPONSIBLE FOR NOTIFYING ALL TRADES OF SUCH DESIGN VALUES.

D. THE CONTRACTOR SHALL PROVIDE ATTACHED VISIBLE PLATES INDICATING THE DESIGN LOADS IN ALL SPACES AS REQUIRED BY APPLICABLE SAFETY REGULATIONS. THE OCCUPANT OF THE BUILDING SHALL BE RESPONSIBLE FOR KEEPING THE ACTUAL LOAD BELOW THE ALLOWABLE LIMITS.

E. CONTRACTOR SHALL DETERMINE IF AN OSHA PERMIT IS REQUIRED. IF SO, IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO OBTAIN SUCH A PERMIT.

F. LACK OF HIGH GUARDRAIL AT BUILDING PARAPETS, FLOOR OPENINGS AND ROOF OPENINGS DOES NOT MEET CURRENT LABOR CODE FOR AN OCCUPIED SPACE. THIS ARCHITECT RECOMMENDS THE USE OF GUARDRAILS AT STATED LOCATIONS. IF GUARDRAILS ARE NOT USED, THE CONTRACTOR SHALL ACCEPT FULL RESPONSIBILITY. IN ADDITION, THE CONTRACTOR SHALL PROVIDE CLEARLY LEGIBLE SIGNS AT THESE LOCATIONS STATING "CAUTION: NO GUARDRAIL".

G. ALL TEMPORARY FLOOR AND ROOF OPENINGS LACKING GUARDRAILS SHALL BE ADEQUATELY COVERED AND DESIGNED TO RESIST CONSTRUCTION TRAFFIC LOADS.

H. CONTRACTOR SHALL VERIFY THAT ALL SKYLIGHTS ARE DESIGNED TO WITHSTAND THE LOADS SPECIFIED IN THE APPLICABLE BUILDING CODES.

I. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE ALL EXISTING UTILITIES WHETHER SHOWN HERON OR NOT. AND TO PROTECT THEM FROM DAMAGE. THE CONTRACTOR SHALL BEAR ALL EXPENSE OF REPAIR OR REPLACEMENT IN CONJUNCTION WITH THE EXECUTION OF THIS WORK.

J. MATERIALS USED IN THIS DESIGN MAY BE HAZARDOUS TO ONES HEALTH. THE CONTRACTOR AND OWNER SHALL ACCEPT ALL RESPONSIBILITY TO USE MATERIALS OR EQUIPMENT IN ACCORDANCE WITH MANUF. INSTRUCTIONS. AND SHALL POST SUCH WARNING DURING PROJECT OCCUPANCY, INCLUDING BUT NOT LIMITED MANUFACTURES SAFETY DATA SHEETS.

77. THE CONTRACTOR, DURING CONSTRUCTION, AND THE TENANT, DURING TENANT'S OCCUPANCY, SHALL ASSUME ALL RESPONSIBILITY FOR PROPER ROOF MAINTENANCE TO INSURE PROPER ROOF DRAINAGE.

ADA ACCESSIBILITY

PARKING STALLS

78. MINIMUM 8 FT. WIDE X 18 FT. LONG WITH 5 FT. X 18 FT. ADJACENT LOADING AREA AND CURB RAMP, OR PER BUILDING DEPARTMENT REQUIREMENTS.

79. LOADING AREA MAY BE BETWEEN TWO STALLS AND SERVE BOTH.

80. MAXIMUM SLOPE: 1/4" PER FOOT IN ANY DIRECTION.

HANDICAPPED RAMP

81. MINIMUM 5 FT. WIDE WITH 5 FT. SQUARE LANDING AT TOP. SEE SITE PLAN ENLARGEMENTS AND/OR DETAILS.

82. MAXIMUM SLOPE: 1" PER FOOT WITH MAXIMUM CROSS SLOPE OF 1/4" PER FOOT.

83. FLARED SIDES: MAXIMUM SLOPE 1-1/2" PER FOOT.

84. BORDER AT TOP OF RAMP: 12" WIDE WITH 1/4" X 1/4" GROOVES AT 3/4' O.C.

85. PROVIDE TRUNCATED DOMES AS PER MOST CURRENT ADA (AMERICANS WITH DISABILITIES ACT) SECTION 705 "DETECTABLE WARNINGS" INCLUDING FIGURES.

PARKING STALL SIGNS

86. AT PARKING SURFACE: 3 FT. X 3 FT. INTERNATIONAL SYMBOL - WHITE FIGURE ON BLUE BACKGROUND.

87. AT INTERIOR END OF STALL CENTERED AT 80" CLEAR ABOVE GRADE ON POST OR 36" ABOVE GRADE ON WALL, A 70 SQUARE INCH REFLECTORIZED SIGN OF BLUE PORCELAIN ON STEEL WITH BEADED TEXT, OR EQUAL, DISPLAYING INTERNATIONAL SYMBOL.

RAMPS TO BUILDING (WITH SLIP RESISTANT SURFACE)

88. MINIMUM WIDTH 48". SEE PLANS FOR ACTUAL DIMENSIONS.

89. SLOPE TO BE 1:12 MAXIMUM TO 1:20 MAXIMUM 2% CROSS SLOPE.

90. HANDRAILS EACH SIDE REQUIRED AT +32" FOR SLOPES EXCEEDING 1:15.

91. WARNING CURB 6" HIGH REQUIRED WHERE DROP-OFF AT SIDE EXCEEDS 4".

92. RAMPS LONGER THAN 10 FT. TO HAVE A 2" HIGH WHEEL GUIDE CURB AT SIDES EXCEPT WHERE BOUNDED BY A WALL OR FENCE.

LANDINGS

93. TOP: MINIMUM 60" SQUARE OR 42"+ DOOR WIDTH LONG BY 60" WIDE WHERE DOOR ENCROACHES.

94. INTERMEDIATE: 60" LONG AT STRAIGHT RAMP, 72" LONG AT CHANGE IN DIRECTION OVER 30 DEGREES (MAXIMUM CHANGE IN ELEVATION BETWEEN LANDINGS TO BE 30").

95. EXTERIOR LEVEL LANDINGS MAY SLOPE UP TO 1/4" IN ANY DIRECTION TO ALLOW FOR SURFACE DRAINAGE.

STAIRS AND HANDRAILS PER BUILDING CODE WITH THE FOLLOWING FEATURES

96. TREADS: SMOOTH WITH ROUNDED OR CHAMFERED EDGES AT TOP AND BOTTOM OF NOSING.

97. NOSING: NOSING SHALL NOT PROJECT MORE THAN 1-1/2" PAST FACE OF THE RISER BELOW.

98. RISERS: TO BE CLOSED. 7" MAXIMUM HEIGHT.

99. HANDRAILS: EXTEND 12" BEYOND TOP NOSING, 12" BEYOND BOTTOM NOSING AT EACH FLIGHT. RETURN EXTENSION TO FACE OF INTERSECTING WALL.

100. PROVIDE A 2" WIDE STRIP OF EQUALLY SLIP-RESISTANT MATERIAL IN CONTRASTING COLOR AT 1" FROM EDGE OF THE LOWEST TREAD AND THE UPPER APPROACH TO EACH STAIR. MARK ALL TREADS AT EXTERIOR STAIRS WITH PAINT OR OTHER APPROVED MATERIAL.

DOORS AND HARDWARE

101. OPENING TO BE MINIMUM OF 32" WIDE X 80" HIGH WHEN DOOR IS AT RIGHT ANGLE TO CLOSED POSITION.

102. BOTTOM 10" OF DOOR TO HAVE SMOOTH UNINTERRUPTED SURFACE FOR OPENING BY WHEELCHAIR FOOT REST.

103. CENTER OF HARDWARE TO BE 30 TO 44 INCHES ABOVE FLOOR. LATCHING AND LOCKING DOORS TO BE OPERABLE WITH A SINGLE EFFORT BY LEVER OR PUSH-PULL TYPE HARDWARE.

104. MAXIMUM EFFORT TO OPERATE DOOR SHALL NOT EXCEED 8.5 POUNDS FOR EXTERIOR DOORS AND 5 POUND FOR INTERIOR DOORS WITH A PULL OR PUSH EFFORT BEING APPLIED AT RIGHT ANGLE TO HINGED DOORS AND AT THE CENTER PLANE OF SLIDING OR FOLDING DOORS. COMPENSATING DEVICES OR AUTOMATIC DOOR OPERATORS MAY BE UTILIZED TO MEET THE ABOVE STANDARDS. WHEN FIRE RATED DOORS ARE REQUIRED, THE MAXIMUM EFFORT TO OPERATE THE DOOR MAY BE INCREASED NOT TO EXCEED 15 POUNDS WITH CLOSER.

105. PROVIDE SYMBOLS ADJACENT TO DOORS LEADING TO SANITARY FACILITIES AS FOLLOWS:

A. MEN'S: 1/4" THICK EQUILATERAL TRIANGLE WITH 12" SIDES VERTEX UP."

B. WOMEN'S: 1/4" THICK 12" DIAMETER CIRCLE.

C. SYMBOLS TO BE ADJACENT TO DOOR FRAMES AT STRIKE SIDE AT 60" HEIGHT, AND FINISH IN COLOR CONTRASTING TO THAT OF THE WALL.

106. THRESHOLDS SHALL BE 1/2" HIGH MAXIMUM ABOVE THE FLOOR WITH 1/4" HIGH MAXIMUM VERTICAL EDGE BELOW A BEVELED EDGE AT 1:2 SLOPE FOR A HEIGHT OF 1/4" MAXIMUM.

107. WIDTH OF CLEAR AREA ON THE SWING SIDE OF THE DOOR SHALL EXTEND 24" PAST THE STRIKE JAMB FOR EXTERIOR DOORS AND 18" PAST STRIKE JAMB FOR INTERIOR DOORS AT WHEELCHAIR ACCESSIBLE AREAS.

DRINKING FOUNTAINS

108. DRINKING FOUNTAINS ARE TO BE IN ALCOVES OR POSITIONED SO AS NOT TO BE IN A CORRIDOR AND SHALL MEET THE FOLLOWING REQUIREMENTS:

A. ALCOVE TO BE MINIMUM 32" WIDE X 18" DEEP WITH DRINKING FOUNTAIN MOUNTED TO PROVIDE A 27" HIGH KNEE CLEARANCE UNDERNEATH.

B. DRINKING FOUNTAIN TO BE FRONT APPROACH WITH HAND OPERATED LEVER WITHIN 6" OF FRONT OF FOUNTAIN OR A PUSH-BAR AT FRONT. BUBBLER OUTLET TO BE WITHIN 6" OF THE FRONT OF THE FOUNTAIN AND 33" ABOVE THE FLOOR WITH WATER STREAM PARALLEL TO THE FRONT EDGE OF THE FOUNTAIN.

C. PROVIDE 30" BY 48" CLEAR FLOOR SPACE FOR FORWARD APPROACH TO LAVATORIES AND DRINKING FOUNTAINS. THIS CLEAR SPACE MAY INCLUDE THE KNEE AND TOE SPACE.

D. MOUNT ELECTRICAL OUTLET BEHIND DRINKING FOUNTAIN.

WATER CLOSET AND COMPARTMENTS FOR THE HANDICAPPED

109. WATER CLOSET SEAT HEIGHT TO BE 17" MINIMUM, 19" MAXIMUM. FLUSH CONTROLS TO BE OPERABLE BY AN OSCILLATING HANDLE WITH A MAXIMUM FORCE OF 3 POUNDS OR BY A REMOTE CONTROL BUTTON.

110. LOCATE CENTERLINE OF WATER CLOSET 18" MINIMUM FROM ONE SIDE OF COMPARTMENTS, 32" CLEAR FROM THE OTHER (OR 28" FROM A FIXTURE WHERE OCCURS), AND 48" CLEAR TO FRONT WALL. (60" AT SIDE HUNG COMPARTMENT DOOR.)

Renaissance ARCHITECTURE, LLC
Bernie Rayner Colbert, Architect
11100 Stratford Drive, Suite A100
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p: 405.749.4642 f: 405.507.1657
renaissancearchitecture.com

SEAL:

08/11/2023

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

SHEET TITLE:
GENERAL NOTES
DATE: 08-10-2023

SHEET NUMBER
G0.302

SCHOOL BUS BARN

HENNESSEY PUBLIC SCHOOLS
HWY 51

NW/4, SEC. 19 T.19N, R.6W, I.M.

KINGFISHER COUNTY, HENNESSEY, OKLAHOMA

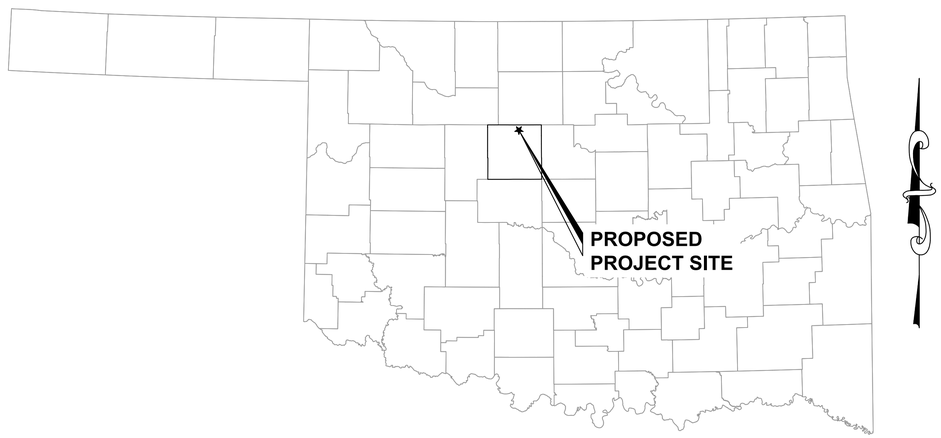
UTILITY WARNING

THE ENGINEER AND SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. AND FURTHER DO NOT WARRANT THAT THE UINDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THE SURVEY OR ENGINEER HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILTIES.

CAUTION!
CONTRACTOR IS TO HAVE ALL UNDERGROUND UTILITIES FIELD MARKED PRIOR TO ANY EXCAVATION.
CALL OKIEONE 1-800-522-6543

811 Know what's **below.** **Call** before you dig.

INDEX OF SHEETS	
SHEET NO.	TITLE
C1	COVER
C2	GENERAL SITE DEVELOPMENT NOTES
C3	SITE PLAN
C4	GRADING PLAN
C5	EROSION CONTROL PLAN
C6	SITE DETAILS
-	TOPOGRAPHIC & BOUNDARY SURVEY



VICINITY MAP
SCALE : NONE

HOLTZEN ENGINEERING GROUP
C.A. #7050 EXP. 6/30/25
302 N. INDEPENDENCE ST. STE. 1100
ENID, OK 73701
p: 580.233.3933 f: 580.548.8906
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Renaissance ARCHITECTURE, LLC
Steven James Burgess, Architect
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renaissancearchitecture.com

SEAL:

SCHOOL BUS BARN
CAMPUS IMPROVEMENTS
HENNESSEY PUBLIC SCHOOLS

HIGHWAY-51 HENNESSEY, OK

REVISIONS:

LABEL:	DATE:
CHECK SET	08/10/2023

SHEET TITLE:
COVER SHEET

DATE: 8/10/2023

SHEET NUMBER
C1

GENERAL SITE DEVELOPMENT NOTES

GENERAL NOTES

1. CONTRACTOR SHALL VERIFY ELEVATIONS OF ALL POINTS OF CONNECTION OR PROPOSED WORK TO EXISTING CURBS, GUTTERS, STREETS, SANITARY SEWER LINES, WATER LINES, ETC... PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL PROVIDE DUST CONTROL MEASURES IN ACCORDANCE WITH THE LOCAL AND STATE REQUIREMENTS.
3. OBSERVATION SITE VISITS, IF ANY BY THE CIVIL ENGINEER OR A REPRESENTATIVE OF THE CIVIL ENGINEER SHALL NOT INCLUDE INSPECTIONS, SPECIAL INSPECTIONS, SAFETY INSPECTIONS, NOR REVIEW OR INSPECTION OF CONSTRUCTION MEANS AND METHODS. OBSERVATION SITE VISITS ARE SOLELY FOR THE PURPOSE OF ASSISTING WITH ACHIEVING CONFORMANCE WITH CONTRACT DOCUMENTS, BUT DO NOT GUARANTEE CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.
4. ALL DISTURBED AREAS SHALL BE SODDED.
5. ALL AREAS WITHOUT A HARD SURFACE OR GRAVEL SHALL BE SODDED.
6. ALL DETAILS ARE TYPICAL UNLESS NOTED OTHERWISE. DETAILS SHALL APPLY TO ALL SIMILAR AND LIKE CONDITIONS.
7. IF CIVIL PLANS/NOTES CONFLICT WITH THE SPECIFICATIONS THE MORE STRINGENT SHALL CONTROL.

SITE MATERIALS

1. ALL MATERIALS FOR PROPOSED CONSTRUCTION AND REPAIRS SHALL BE NEW PRODUCTS DIRECTLY FROM THE FACTORY FREE OF DEFECTS.
2. MATERIALS USED ON MUNICIPAL PUBLIC RIGHT-OF-WAYS SHALL MEET THE MUNICIPAL CONSTRUCTION STANDARDS.
3. SANITARY SEWER PIPE
   A. ASTM D3034 TYPE PSM, PVC SDR 35
4. WATER LINE PIPE
   A. 3/4" TO 3" DIAMETER: AWWA C901 PE 4710 SDR9
   B. 4" TO 12" DIAMETER: AWWA C900 PVC DR18
   C. 14" TO 48" DIAMETER: AWWA C905 PVC DR18
   D. WATER LINE FITTINGS SHALL CONFORM TO AWWA C153
5. GRAVEL SURFACE - 1 1/2" LIMESTONE CRUSHER RUN\.
6. CONCRETE:
   A. ALL SITE CONCRETE CONSTRUCTION SHALL COMPLY WITH ACI 211.1-91, 301, 304, 318, AND 347.
   B. READY-MIXED CONCRETE PER ASTM C94.
   C. ALL CONCRETE SHALL BE MADE WITH STONE AGGREGATE.
   D. CEMENTITIUOS MATERIALS SHALL BE OF THE SAME TYPE, BRAND, AND SOURCE THROUGHOUT THE PROJECT.
   E. CONCRETE MATERIAL SHALL MEET THE FOLLOWING (UNLESS STATED OTHERWISE IN THE SPECIFICATIONS)
      a. PORTLAND CEMENT: ASTM C150, TYPE I
      b. FLY ASH: ASTM C618, CLASS C (20% MAXIMUM BY WEIGHT)
      c. NORMAL-WEIGHT AGGREGATE: ASTM C33, GRADED (MAXIMUM 1 1/2" AGGREGATE)
      d. WATER: ASTM C94 AND POTABLE
      e. AIR-ENTRAINMENT: ASTM C260
   G. PREPARE DESIGN MIXTURES FOR CONCRETE WITHIN THE PROPERTY BOUNDARIES WITH THE FOLLOWING PROPERTIES:

CONCRETE MIX SCHEDULE

TYPE OF PRIVATE CONSTRUCTION	28 DAY COMPRESSIVE STRENGTH (PSI)	MAX. SLUMP (INCH) (±1.0")	AIR ENTRAINMENT (±1.0%)	MIN. CEMENTIOUS MATERIAL (lbs/C.Y.)	MAXIMUM W/C RATIO
PAVING	3,500	3	6.0	517	0.475
SIDEWALKS	3,000	2	6.0	470	0.50
TANK CONTAINMENT	3,000	5	6.0	470	0.50
DRAINAGE STRUCTURES	3,000	4	6.0	470	0.50

7. STEEL REINFORCEMENT
   A. REINFORCING BARS: ASTM A615, GRADE 60, DEFORMED
   B. SMOOTH DOWEL BARS: ASTM A615, GRADE 60, PLAIN-STEEL BARS.
   C. REINFORCING BARS SHALL BE CENTERED IN THE PAVING SECTION, UNLESS NOTED OTHERWISE.

GENERAL CONSTRUCTION NOTES

1. ALL WORK ON MUNICIPAL RIGHT-OF-WAY SHALL COMPLY WITH MUNICIPAL STANDARDS AND CONSTRUCTION SPECIFICATIONS AND ALL WORK ON OKLAHOMA DEPARTMENT OF TRANSPORTATION (ODOT) RIGHT-OF-WAY SHALL COMPLY WITH ODOT STANDARDS AND CONSTRUCTION SPECIFICATIONS. CONTRACTOR SHALL COORDINATE WITH MUNICIPAL INSPECTORS AND/OR ODOT INSPECTORS FOR WORK ON RIGHT-OF-WAY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN THE RIGHT-OF-WAY OWNER'S STANDARD DRAWINGS AND SPECIFICATIONS.
2. ALL TESTING ON RIGHT-OF-WAY SHALL BE IN ACCORDANCE WITH RIGHT-OF-WAY OWNER'S STANDARD SPECIFICATIONS, AND AT MINIMUM MEET PROJECT REQUIREMENTS.
3. DRIVEWAY CONSTRUCTION SHALL CONFORM TO THE CITY'S STANDARD CONCRETE DRIVE DETAIL.
4. FOR ALL WORK ON RIGHT-WAY THE CONTRACTOR IS RESPONSIBLE FOR ARRANGING A PRE-CONSTRUCTION MEETINGS AND OBTAINING THE REQUIRED CONSTRUCTION PERMITS FROM THE RIGHT-OF-WAY OWNERS.
5. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VISIT THE PROPOSED CONSTRUCTION SITE TO VERIFY SITE CONDITIONS.
6. CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES BEFORE STARTING EXCAVATION. CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION OF AND THE PROTECTION OF EXISTING BURIED UTILITIES. UTILITIES ARE SHOWN FOR GENERAL INFORMATION ONLY, ACTUAL LOCATION AND DEPTH DOES VARY AND SHALL BE FIELD VERIFIED. CONTRACTOR SHALL HAVE UTILITY COMPANIES PROVIDE EXACT LOCATIONS BEFORE EXCAVATING. CONTRACTOR SHALL MAKE EVERY EFFORT TO PROTECT EXISTING UTILITY LINES, DAMAGED UTILITY LINES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE.
7. PRIVATE UTILITY LINES MAY NOT BE SHOWN ON THE DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING PRIVATE UTILITIES. DAMAGED UTILITIES SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.
8. CONTRACTOR SHALL FOLLOW THE PROJECT SPECIFICATIONS OR UTILITY OWNER SPECIFICATIONS WHICHEVER IS MORE STRICT, WHEN WORKING IN A UTILITY EASEMENT AND NEAR EXISTING UTILITIES.
9. WHEN PETROLEUM PIPE LINES OR HIGH VALUE TELECOMMUNICATION LINES ARE WITHIN THE CONSTRUCTION LIMITS, THE CONTRACTOR SHALL PROVIDE ADEQUATE NOTIFICATION TO THE UTILITY COMPANIES, AND COORDINATE WORK.
10. IT SHALL BE CONTRACTORS RESPONSIBILITY TO PROVIDE WASTE AREAS OR DISPOSAL SITES FOR EXCESS MATERIAL WHICH IS NOT DESIRABLE TO BE INCORPORATED INTO THE WORK ON THIS PROJECT.
11. TESTING LABORATORY FEES ARE TO BE PAID BY CONTRACTOR.
12. CONSTRUCTION STAKING IS TO BE FURNISHED BY THE CONTRACTOR.
13. FOR RIGHT-OF-WAY WORK THE CONTRACTOR SHALL SUBMIT TO THE CITY ENGINEER FOR APPROVAL A TRAFFIC CONTROL PLAN PRIOR TO CONSTRUCTION.
14. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING TRAFFIC CONTROL SIGNS. IF EXISTING SIGNS CONFLICT WITH CONSTRUCTION, CONTRACTOR SHALL MOVE AND MAINTAIN SIGNS THROUGHOUT PROJECT AND REPLACE SIGNS TO ORIGINAL LOCATION. CONTRACTOR SHALL PLACE AND MAINTAIN TEMPORARY SIGNS AS NEEDED.
15. WHERE REQUIRED THE CONTRACTOR SHALL SAWCUT THE EXISTING PAVEMENT TO OBTAIN A CLEAN, STRAIGHT EDGE PRIOR TO PLACING NEW ABUTTING CONCRETE.
16. FOR OFF-SITE WORK THE CONTRACTOR SHALL BE RESPONSIBLE TO NOTIFY THE BUSINESS AND HOME OWNERS TO COORDINATE THE WORK. CONTRACTOR SHALL PROVIDE NOTICE IN THE FORM OF DOOR HANGER TO ALL RESIDENTS AND/OR BUSINESSES A MINIMUM OF 48 HOURS PRIOR TO SHUTTING OFF WATER.
17. CONTRACTOR IS RESPONSIBLE FOR OBTAINING A STORMWATER DISCHARGE PERMIT FROM THE OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY.
18. CONTRACTOR SHALL NOT INCREASE DRAINAGE FROM SITE ONTO ADJACENT PROPERTIES.
19. CONTRACTOR SHALL NOT BLOCK DRAINAGE FROM ADJACENT PROPERTIES.
20. ALL SIDEWALK AND CURB RAMP CONSTRUCTION SHALL MEET ADA REQUIREMENTS AND CITY STANDARDS.

UTILITY CONSTRUCTION NOTES

1. TRENCHING OR EXCAVATION WHICH CROSSES EXISTING AND/OR PROPOSED STREETS, DRIVES, PAVING, GRAVEL SURFACES, AND SIDEWALKS SHALL BE COMPACTED TO 95% OF THE STANDARD PROCTOR DENSITY (ASTM D-698).
2. ALL WATER LINE PIPES SHALL HAVE A MINIMUM 36" OF COVER.
3. AT WATER AND SEWER LINE CROSSINGS WHERE NEW OR EXISTING SERVICE WATER LINES ARE LESS 12" CLEAR DISTANCE ABOVE SEWER LINES, SLEEVE WATER LINES WITH ASTM D3034 PVC SDR 26 PIPE PER INTERNATIONAL PLUMBING CODE REQUIREMENTS FOR A MINIMUM DISTANCE OF 5' EACH WAY FROM THE CENTER OF THE SEWER LINE, SLEEVES SHALL BE FILLED OR TIGHTLY CAULKED PER THE INTERNATIONAL BUILDING CODE. (CONTRACTOR MAY LOWER WATER LINE AT CROSSING TO OBTAIN A 24" CLEAR DISTANCE, PROVIDE ADEQUATE SUPPORT AT UNSUPPORTED SEWER LINE.)
4. REFER TO DETAILS FOR PIPE BACKFILL.
5. CONTRACTOR WILL BE RESPONSIBLE FOR RETURNING TO THE JOB SITE TO REPAIR ANY SETTLING OF BACKFILL THAT OCCURS DURING THE MAINTENANCE PERIOD.
6. INSTALLATION OF PIPE SHALL INCLUDE INSTALLATION OF 12 GAUGE TRACER WIRE AND LOCATOR TAPE.
7. ALL TRACER WIRE (MAIN AND SERVICE LINES) SHALL BE INTERCONNECTED SO THAT THE LOCATES CAN BE PERFORMED FROM SINGLE ENERGIZED POINT AND DETECTOR TAPE 2 FOOT BELOW GROUND LEVEL.
8. ALL WATER VALVES SHALL BE INSTALLED BEHIND CURB AND OUT OF PAVEMENT SURFACE WHEREVER POSSIBLE.
9. ALL VALVES, MANHOLE LIDS, CLEAN OUTS, AND OTHER ITEMS WITHIN THE PAVING SHALL BE FLUSH WITH THE FINAL PAVING GRADES AND SHALL BE RATED FOR H-20 TRUCK LOADING.
10. ALL METER BOXES SHALL BE ACCESSIBLE AND COVERED AT THE COMPLETION OF EACH WORK DAY. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO LOCATE AND UNCOVER ANY METERS WHICH REQUIRE ACCESS.
11. CONTRACTOR SHALL PROVIDE ACCESS TO ALL BUSINESSES AND RESIDENTS AT ALL TIMES. NO MORE THAN ONE THOUSAND FEET OF TRENCH SHALL BE OPEN AT ONCE.
12. ALL TESTING, COMPACTION, SERVICE CONNECTIONS, CLEAN UP AND PAVEMENT REPAIR SHALL BE COMPLETED BEFORE REMOVING ADDITIONAL PAVEMENT AND OPENING NEW TRENCH.
13. BORE PITS AND LOCATIONS SHALL BE ADJUSTED AS DIRECTED AND/OR AGREED BY THE ENGINEER PRIOR TO CONSTRUCTION.
14. WITHIN RIGHT-OF-WAYS ALL BORES UNDER PAVEMENT SHALL BE PERFORMED BY EITHER JACKING, DRY BORING, OR TUNNELING. METHODS SHALL BE APPROVED BY THE ENGINEER. WHEN PERFORMED ON CITY OR HIGHWAY RIGHT-OF-WAY APPROVAL SHALL BE REQUIRED BY THE CITY ENGINEER OR ODOT DIVISION ENGINEER, RESPECTIVELY.
15. CONTRACTOR SHALL INSTALL EITHER "LOCKING RUBBER" SEALS, THRUST BLOCKS, MEGALUGS AT SECTIONS OF PIPE NOT CONTINUOUS WITH THE ADJOINING PIPE SYSTEM IN ORDER TO ALLOW FOR PRESSURE TESTING OF THE PIPE.
16. PRESSURE TESTING AT 150 PSI FOR TWO HOURS AND DISINFECTION WILL BE REQUIRED ON THIS PROJECT. ALL WATER MAINS SHALL BE DISINFECTED IN ACCORDANCE WITH AWWA SPECIFICATIONS BEFORE BEING PUT TO USE.
17. CONTRACTOR SHALL MAINTAIN AN UP-TO-DATE SET OF AS-BUILT PLANS DURING CONSTRUCTION. COMPLETED AS-BUILTS SHALL BE SUBMITTED TO THE ENGINEER.
18. MEGALUGS SHALL BE USED ON ALL FITTINGS.
19. CONTRACTOR SHALL USE AN APPROVED JOINT RESTRAINT SYSTEM FOR ALL BORES USING PVC PIPE(EAGLE LOK 900, CERTA-LOK, ETC.). PVC PIPE SHALL BE PULLED THROUGH BORES, NOT PUSHED. BORES 20' OR LESS (IE. DRIVEWAYS) DO NOT REQUIRE RESTRAINED JOINTS.
20. ALL FIRE HYDRANTS SHALL BE PAINTED AS DIRECTED THE LOCAL MUNICIPALITY, IF NONE PAINT RED.
21. NO ADDITIONAL PAYMENT SHALL BE MADE FOR INSTALLING WATER LINES WITH MORE THAN 3 FT. COVER DUE TO OBSTRUCTIONS. (STORM SEWER, UTILITIES, ETC.)
22. CONTRACTOR SHALL VERIFY CLEARANCES WITH ALL UNDERGROUND OBSTRUCTIONS AND FOR GRAVITY LINES UPSTREAM & DOWNSTREAM FLOW LINES PRIOR TO CONSTRUCTION.

SURVEY

BOUNDARY AND TOPOGRAPHIC SURVEY WAS PERFORMED BY PORTERFIELD SURVEYING INC., DATED 6/20/2023.

BENCHMARKS

BENCHMARK NO. 1 - SET MAGNETIC NAIL & WASHER ON WEST EDGE OF FIELD INLET SOUTH OF STATE HWY. 51.
ELEVATION 1149.88 (NAVD88)
BENCHMARK NO. 2 - TOP OF YELLOW CAP ON 3/8" IRON PIN AT SOUTH EAST PROPERTY CORNER.
ELEVATION 1147.76 (NAVD88)

EXISTING ODEQ ON-SITE SEWAGE PERMIT (FOR INFORMATION ONLY)

DEQ OKLAHOMA Department Of Environmental Quality — ...for a clean, attractive, prosperous Oklahoma

System No: 98014 Date:

ENVIRONMENTAL COMPLAINTS AND LOCAL SERVICES DIVISION
ON-SITE SEWAGE TREATMENT SYSTEM INSPECTION REPORT

Authorization No. 24418
System No. 98014
Date Final Recd

PLEASE PRINT

I. PROPERTY INFORMATION
Name / Mailing Address of Owner: HENNESSEY (First Name) SCHOOL (Last Name) (Address) (City) (State) (Zip Code)
Property Address: 808 E JACK CHOATE AVE (Street Address) HENNESSEY (City) OK (State) 73742 (Zip Code) KINGFISHER (County)
Legal Description: (1/4 and 1/2 's) 19 (Section) 19N (Township) 6W (Range) (Lot) (Block) (Subdivision)
Finding Location: Hennessey Bus Barn, South of 4Ts grocery store (Blocks or miles from a given point)

II. GENERAL INFORMATION:
TYPE OF WORK: ☑ New Installation ☐ Modification ☐ Repair
ALTERNATIVE SYSTEM: ☐ Yes ☑ No
TYPE OF SYSTEM: ○ Conventional Subsurface ○ Low Pressure Dosing ○ Shallow Extended ○ Lagoon ◉ ET/A ○ Aerobic -Manufacturer:
DESIGN FLOW: ☐ Individual w / [ ] bedrooms ☐ Small Public System [ ] gal/day – Type: [ ]
REPORT FOR ON-SITE SEWAGE COMPLETED BY: [ ] (Name) CLASSIFIED AS CLASS V INJECTION WELL: ☐ Yes ☑ No
SOIL TEST RESULTS: ☐ None ☐ Soil Group [ ] ☐ Percolation Rate [ ] min/in DATE SOIL TEST CONDUCTED: [ ]

III. SYSTEM COMPONENTS:

			NOTES
LIFT STATION	Tank: ☐ Plastic/Fiberglass ☐ Concrete	Liquid capacity: [ ] gallons	
TRASH TANK / SEPTIC TANK	Tank: ☐ Plastic/Fiberglass ☑ Concrete	Liquid capacity: 1000 gallons	
AEROBIC TREATMENT UNIT	ATU: ☐ Plastic/Fiberglass ☐ Concrete	Capacity rating: [ ] gpd	
FLOW EQUALIZATION TANK	Tank: ☐ Plastic/Fiberglass ☐ Concrete	Liquid capacity: [ ] gallons; Dosing rate: [ ] gph	
LOW PRESSURE DOSING TANK	Tank: ☐ Plastic/Fiberglass ☐ Concrete	Liquid capacity: [ ] gallons; Dosing rate: [ ] gph	
DISINFECTION	Method of Disinfection Used: ☐ Liquid Chlorinator	☐ ANSI/NSF 46	
ATU PUMP TANK	Tank: ☐ Plastic/Fiberglass ☐ Concrete	Liquid capacity: [ ] gallons	
IRRIGATION	☐ Drip - Total length of line: [ ] feet.	☐ Spray -Total irrigation area: [ ] ft²	
ABSORPTION TRENCHES	Retention structures used: ☐ Yes ☑ No; Total trench length: 104 feet	Trench depth: 24 inches	
	Media used: ☐ Rock ☑ Chambers ☐ Polystyrene ☐ Other: [ ]	Media depth: 12 inches	
LAGOON	Bottom dimensions: [ ] feet x [ ] feet		

Revised 1/1/09 DEQ Form 641-576A/S

System No: 98014 Date:

IV. INSTALLER INFORMATION:
Name: David (First Name) Fuksa (Last Name) Date Work Completed: 8/14/2011 Is Installer Certified: ☐ Yes ☑ No
Mailing Address: RR1 Box 64 A (Address) Hennessey (City) OK (State) 73742 (Zip Code) 4058930311 (Phone #:)

V. CERTIFIED INSTALLER USE ONLY:
I hereby certify that I installed / modified / repaired the above-described on-site sewage treatment system in compliance with OAC 252:641.
(Installer's Signature) (Installer's Name) (Installer's Certification #) (Date Signed)

VI. DEQ USE ONLY:
☑ SYSTEM INSPECTED BY DEQ ON (Date): 8/14/2011
☑ DEQ Final Inspection ☐ Joint Inspection
☑ This system COMPLIES with OAC 252:641
☐ This system FAILS to comply with OAC 252:641
OR
☐ DEQ REVIEWED CERTIFIED INSTALLER'S FINAL INSPECTION
☐ Date Filed: [ ] ☐ Date Rejected: [ ]
Notes: [ ]

Environmental Specialist's Signature
Crosswhite, Warren (Environmental Specialist) 6115 (Employee ID) 8/14/2011 (Date Signed) 8/14/2011 (Date Paperwork Issued)

NOTE: Record separation distances and sketch the layout of the system.

Revised 1/1/09 DEQ Form 641-576A/S

System No: 98014 Date:

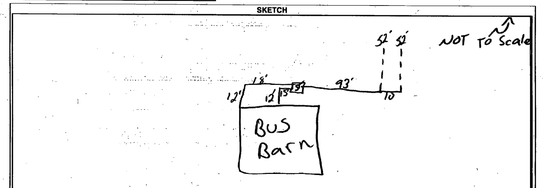
System No. 98014
Owner's Last Name: SCHOOL

VII. SEPARATION DISTANCES:
Record all applicable separation distances in feet.

	Trash Tank/ Septic Tank	Flow Equalization Tank	Lift Station	ATU	Pump Tank	Solid Pipe	Perforated Pipe / Chambers	Sprinkler Heads	Sprinkler Spray	Drip Irrigation Lines	Lagoon
Private Water Supply:	>100						>100				
Public Water Supply:	>300						>300				
Buildings:						N/A	>50	N/A	N/A		
Other Structures:	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A		N/A
Waterline:	>100						>50		N/A		
Property Line:	>50						>25				
Impoundment/Stream:						N/A					
French Drain:						N/A					

VIII. LAYOUT OF SYSTEM:
Sketch a detailed drawing of the system installation/modification in the box below making sure to differentiate between existing components and new or modified ones.
'Double click on "InfoPath Sketchbox.xlsm"
InfoPath Sketchbox.xlsm
Microsoft Office Excel Macro-Enabled Worksheet
18.2 KB

SKETCH



REMARKS:

○ or ▭ Septic Tank; ☐ Distribution Box; ▨ Retention Structure; T Tee; L Ell; † Cross; 0 Water Well; ---- Absorption Line or Drip Line

Revised 1/1/09 DEQ Form 641-576A/S

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Oklahoma City, OK 73120-7200
p: 405.749.4842 f: 405.507.1657
renaissancearchitecture.com

SEAL:

SCHOOL BUS BARN CAMPUS IMPROVEMENTS
HENNESSEY PUBLIC SCHOOLS
HIGHWAY-51 HENNESSEY, OK

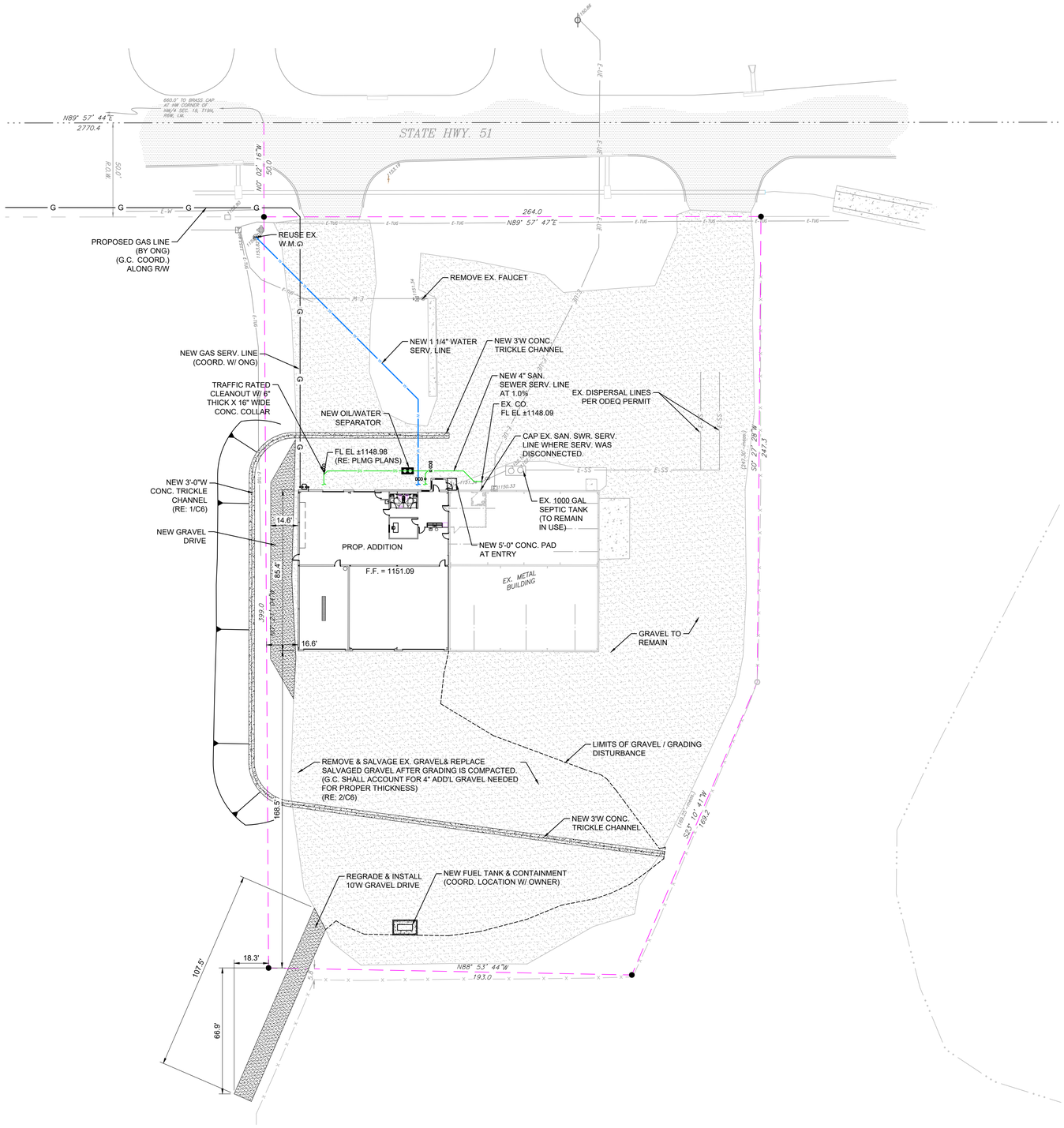
REVISIONS:

LABEL:	DATE:
CHECK SET	08/10/2023

SHEET TITLE:
GENERAL SITE DEVELOPMENT NOTES
DATE: 8/10/2023

SHEET NUMBER
C2

HOLTZEN ENGINEERING GROUP
C.A. #7050 EXP. 6/30/25
301 N. INDEPENDENCE ST. | STE. 1000
ENID, OK 73701
P: 580.541.7313 F: 580.540.8906
www.holtzen-engineering.com



SEPTIC TANK NOTES:

1. THE ORIGINAL PERMIT AND GENERAL LAYOUT OF DISPERSAL FIELD IS ON SHEET C2.
2. AVERAGE DAILY FLOW FOR SEPTIC SYSTEM DESIGN IS 25 GALLONS PER DAY.
3. LOCAL ODEQ CONTACT IS JAMES BAKER, P. (580)-234-0998

N

0 1" = 30 FT. 60 Feet

L E G E N D

EXISTING STORM SEWER E-ST	PROPOSED STORM SEWER ST
EXISTING SAN. SEWER E-SS	PROPOSED SAN. SEWER SS
EXISTING WATER E-W	PROPOSED WATER W
EXISTING OVER-HEAD ELEC. E-OHE	PROPOSED O.H. ELEC OHE
EXISTING U.G. ELEC. E-UE	PROPOSED U.G. ELEC UE
EXISTING NAT. GAS E-G	PROPOSED NAT. GAS G
EXISTING O.H. TELE. CABLE E-T	PROPOSED O.H. TELEPHONE T
EXISTING U.G. TELE. CABLE E-TUG	PROPOSED U.G. TELEPHONE TUG
EXISTING T.V. E-TV	PROPOSED CABLE TV TV
EXISTING FIBER OPTIC CABLE E-FO	PROPOSED FIBER OPTIC FO
EXISTING FENCE LINE	PROPOSED FENCE LINE
EXISTING FLOW LINE	PROPOSED FLOW LINE
	PROPOSED LAY OF HOSE

GAS METER		GAS VALVE	
POWER POLE		LIGHT POLE	
S.S. MANHOLE	SS	GUY WIRE	
STM. S. MANHOLE	ST	FIRE HYDRANT	
ELEC. BOX	E	WATER METER	WM
TELEPHONE POLE	T	WATER VALVE	WV
SBC BOX	T	S.S. CLEAN OUT	CO
U-G TRAFFIC CTRL. SIGNAL BOX		2 WAY CLEAN OUT	DCO
ST. GRATE / BASIN		DOWN SPOUT	DS
PARKING BUMPER		FREEZE PROOF - YARD HYDRANT	FPYH
TRUNCATED DOMES		SIGN	
BOLLARD		HANDICAPPED SIGN	

EX. BUILDING · EX. CONCRETE · EX. S/W · EX. GRAVEL · EX. ASPHALT

PROP. BUILDING · PROP. CONCRETE · PROP. S/W · PROP. GRAVEL · PROP. PAVING 1 · PROP. DETENTION

SIDEWALK JOINT · CONSTRUCTION JOINT · SAW JOINT · EXPANSION JOINT

SHEET NOTES:

1. THIS DOCUMENT USES COLOR HATCH AND LINE WORK TO IDENTIFY ITEMS. IT IS THE CONTRACTORS RESPONSIBILITY TO OBTAIN COLOR DOCUMENTS. CONTRACTOR SHALL INCLUDE REPRODUCTION OF PLANS IN COLOR.

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SEAL:

OKLAHOMA REGISTERED PROFESSIONAL ENGINEER SCOTT HOLTZEN 27396 LICENSED

SCHOOL BUS BARN CAMPUS IMPROVEMENTS

HENNESSEY PUBLIC SCHOOLS

HIGHWAY-51 HENNESSEY, OK

REVISIONS:

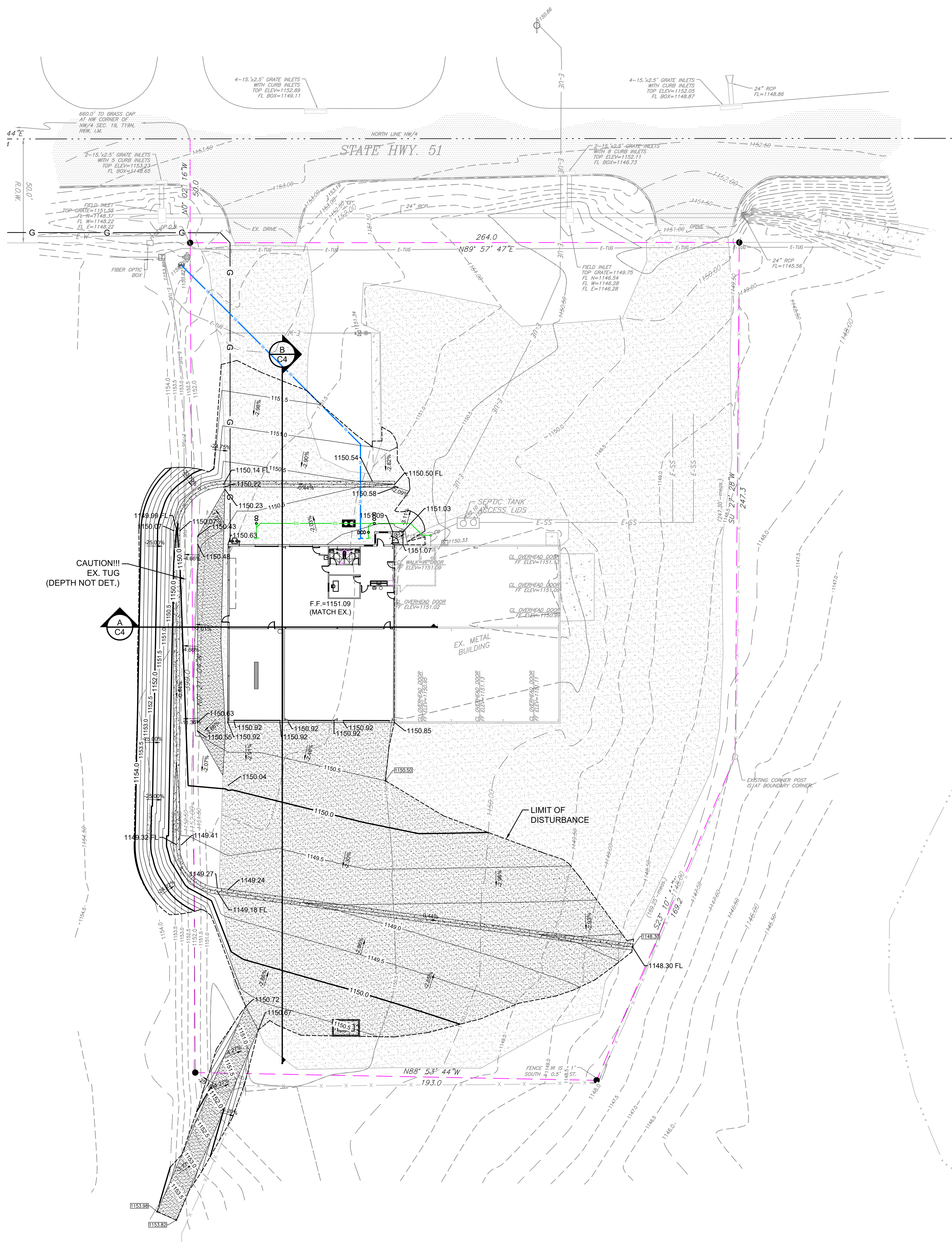
LABEL:	DATE:
CHECK SET	08/10/2023

SHEET TITLE: **SITE PLAN**

DATE: 8/10/2023

SHEET NUMBER

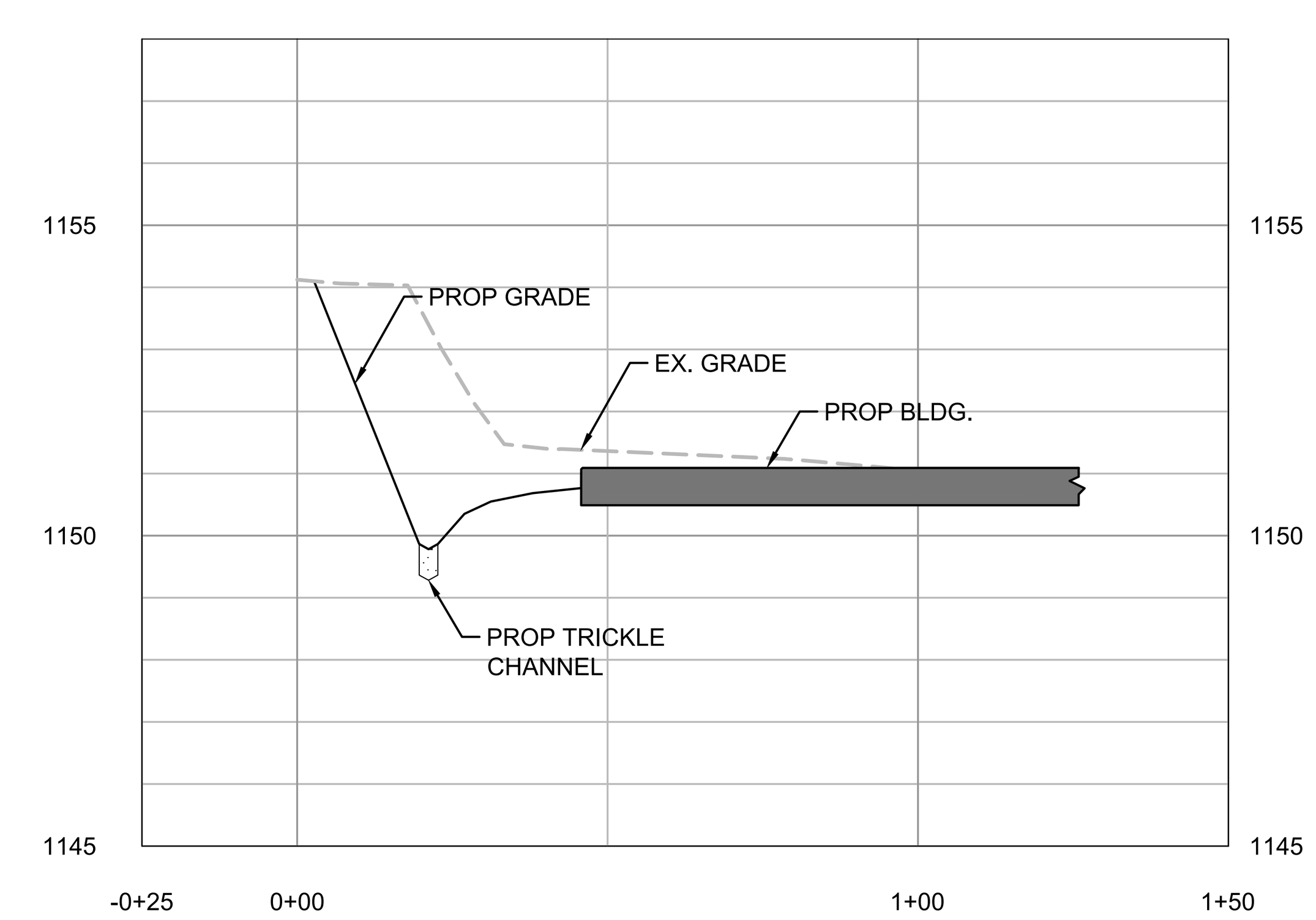
C3



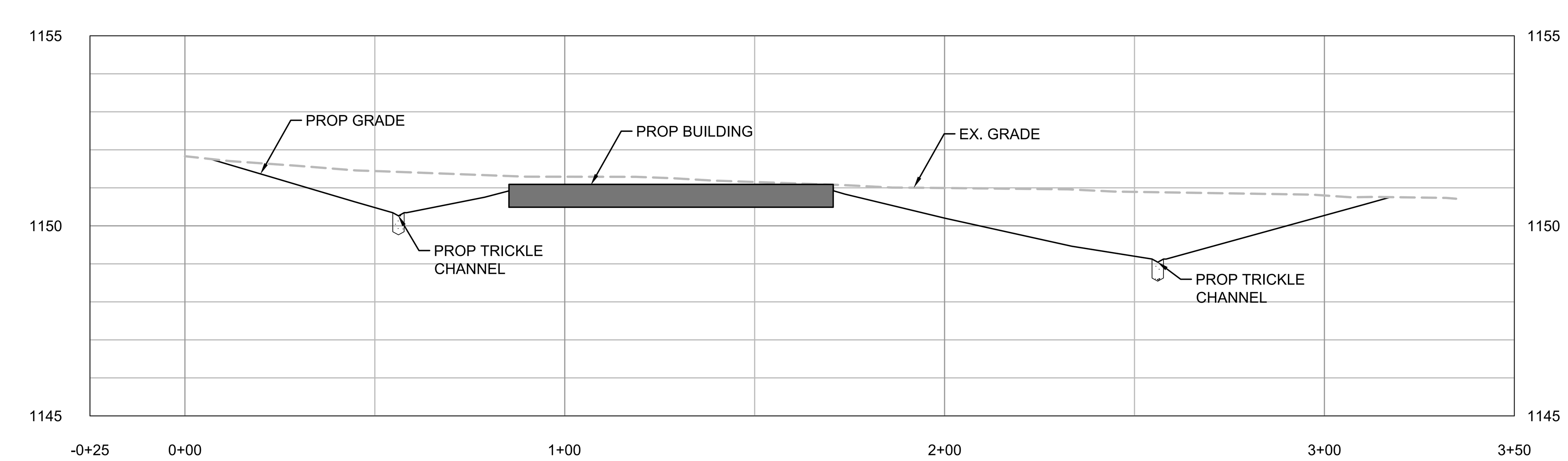
N

0 1" = 30 FT. 60 Feet

SECTION A PROFILE



SECTION B PROFILE



LEGEND

99.0	EXIST. CONTOURS
98.0	PROPOSED CONTOURS
921.30	EXIST. ELEV. PT
920.10	PROPOSED ELEV. PT.
920.10 G	PROP. GUTTER ELEV.
920.10 TC	PROP. TOP CURB ELEV.
920.10 FL	PROP. FLOW LINE ELEV.
920.10 TOG	PROP. TOP OF GRATE ELEV.
920.10 TOW	PROP. TOP OF WALL ELEV.
920.10 TW	PROP. TOP OF S/W ELEV.
920.10 G.B.	PROP. GRADE BREAK ELEV.
-0.50%	PROP. CROSS SLOPE & FL SLOPE ARROW
-5.0%	PROP. SLOPE ARROW
	EXIST. FLOW LINE
	PROPOSED FLOW LINE
	PROPOSED RIDGE LINE
	PROPOSED DRAINAGE PIPE
	PROP. DETENTION

SHEET NOTES:

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2. REFER TO SITE PLAN FOR HATCH LEGEND,

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SEAL:

LICENSED PROFESSIONAL ENGINEER
SCOTT E. HOLTZEN
23396
OKLAHOMA

SCHOOL BUS BARN CAMPUS IMPROVEMENTS

HENNESSEY PUBLIC SCHOOLS

HIGHWAY-51 HENNESSEY, OK

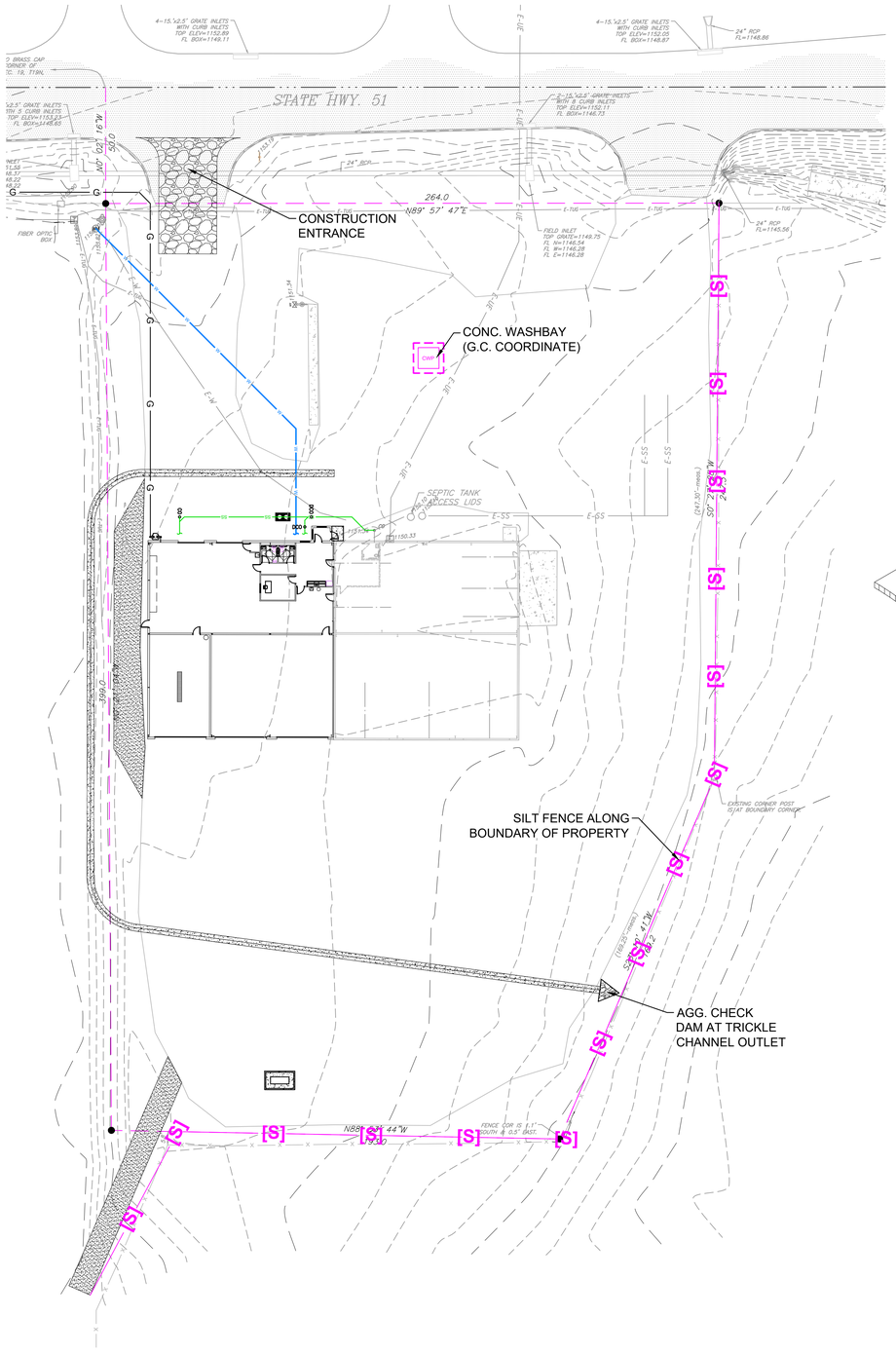
REVISIONS:

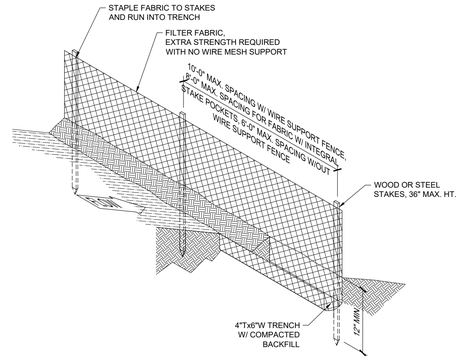
LABEL:	DATE:
CHECK SET	08/10/2023

SHEET TITLE:
GRADING PLAN

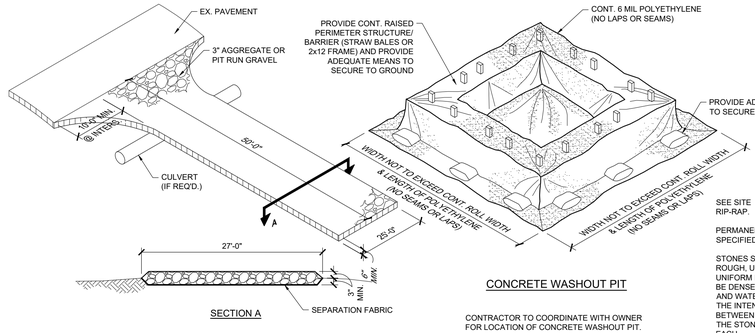
DATE: 8/10/2023

SHEET NUMBER
C4





SILT FENCE DETAIL

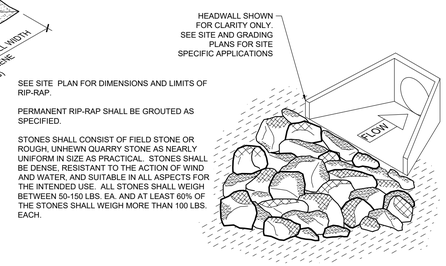


CONSTRUCTION ENTRANCE DETAIL

CONTRACTOR TO COORDINATE WITH OWNER FOR LOCATION OF CONSTRUCTION ENTRANCE.

CONCRETE WASHOUT PIT

CONTRACTOR TO COORDINATE WITH OWNER FOR LOCATION OF CONCRETE WASHOUT PIT.



SEE SITE PLAN FOR DIMENSIONS AND LIMITS OF RIP-RAP.

PERMANENT RIP-RAP SHALL BE GROUTED AS SPECIFIED.

STONES SHALL CONSIST OF FIELD STONE OR ROUGH, UNHEWN QUARRY STONE AS NEARLY UNIFORM IN SIZE AS PRACTICAL. STONES SHALL BE DENSE, RESISTANT TO THE ACTION OF WIND AND WATER, AND SUITABLE IN ALL ASPECTS FOR THE INTENDED USE. ALL STONES SHALL WEIGH BETWEEN 50-150 LBS. EA. AND AT LEAST 60% OF THE STONES SHALL WEIGH MORE THAN 100 LBS. EACH.

AGGREGATE CHECK DAM

SHEET NOTES:

1. THIS DOCUMENT USES COLOR HATCH AND LINE WORK TO IDENTIFY ITEMS. IT IS THE CONTRACTORS RESPONSIBILITY TO OBTAIN COLOR DOCUMENTS.
2. REFER TO SITE PLAN FOR HATCH LEGEND.

L E G E N D

- [S] SILT FENCE
- AGGREGATE CONSTUCTION ENTRANCE
- FIBER LOG
- CWP CONCRETE WASHOUT PIT
- INLET SEDIMENT BARRIER
- INLET PROTECTION
- AGGREGATE CHECK DAM

N

0 1" = 30 FT. 60 Feet

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SEAL:

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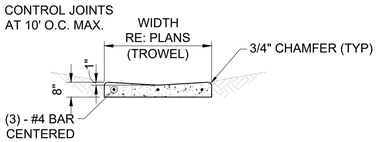
HIGHWAY-51 HENNESSEY, OK

REVISIONS:
LABEL: DATE:
CHECK SET 08/10/2023

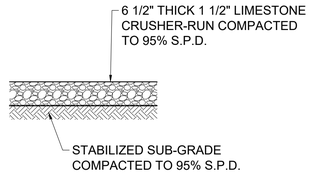
SHEET TITLE:
EROSION CONTROL PLAN
DATE: 8/10/2023

SHEET NUMBER
C5



1 TYPICAL TRICKLE CHANNEL DETAIL

N.T.S.



2 GRAVEL SECTION

N.T.S.

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SEAL:

SCHOOL BUS BARN
CAMPUS IMPROVEMENTS
HENNESSEY PUBLIC SCHOOLS

HIGHWAY-51 HENNESSEY, OK

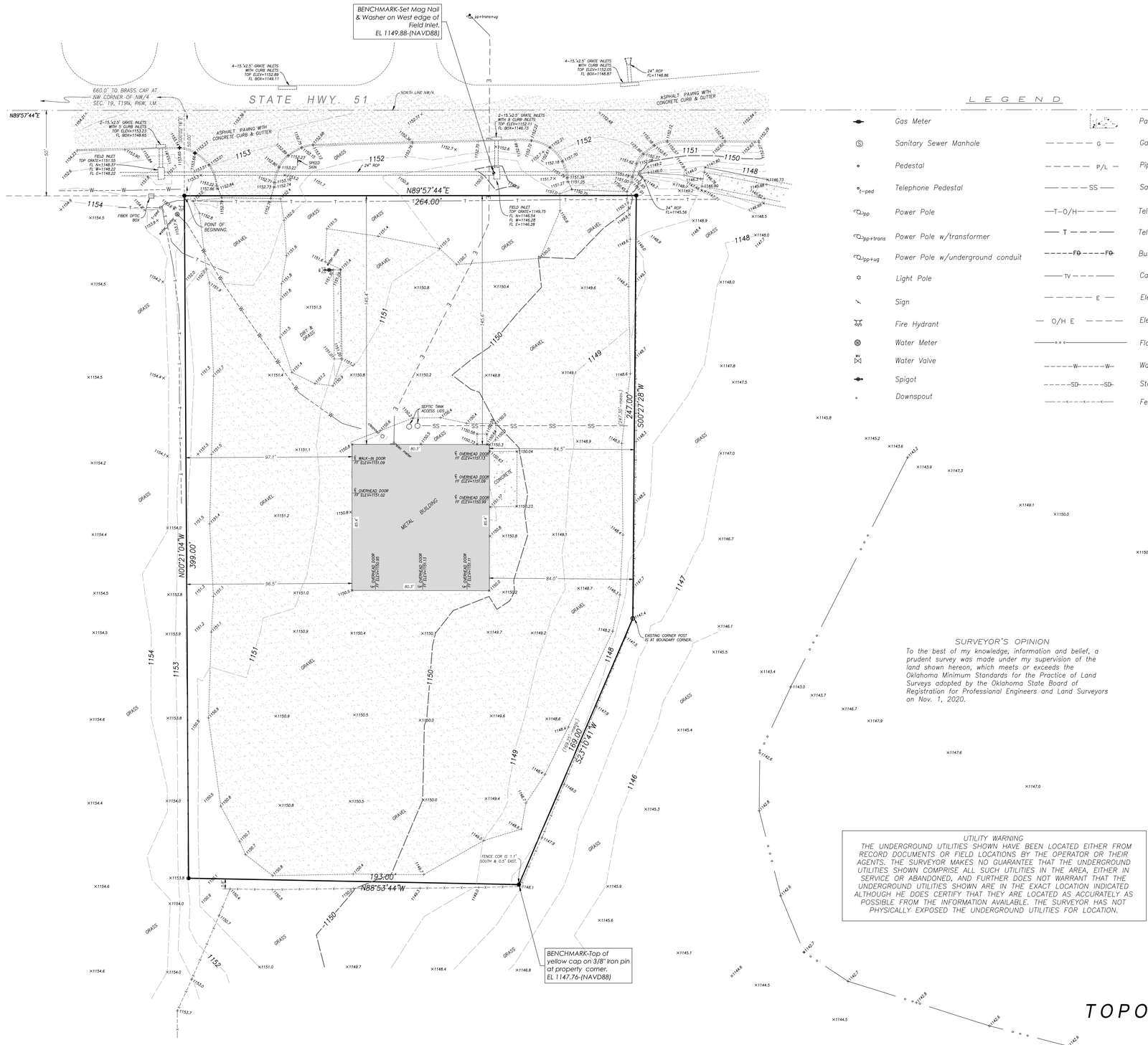
REVISIONS:

LABEL:	DATE:
CHECK SET	08/10/2023

SHEET TITLE:
SITE DETAILS

DATE: 8/10/2023

SHEET NUMBER
C6



LEGEND

- Gas Meter
- Sanitary Sewer Manhole
- Pedestal
- Telephone Pedestal
- Power Pole
- Power Pole w/transformer
- Power Pole w/underground conduit
- Light Pole
- Sign
- Fire Hydrant
- Water Meter
- Water Valve
- Spigot
- Downspout
- Paved Area
- Gas Line
- Pipeline
- Sanitary Sewer Line
- Telephone Line–Overhead
- Telephone Line–Buried
- Buried Fiber Optic Line
- Cable TV Line
- Electric Line–Buried
- Electric Line–Overhead
- Flow Line of Ditch / Stream
- Water Line
- Storm Sewer Line
- Fence Line

SCALE: 1" = 30'

BEARINGS HEREON ARE RELATIVE TO THE GRID (NAD83) BEARING OF N89°57'44"E ALONG THE NORTH LINE OF THE NW/4

0 15 30 60 120

CONTOUR INTERVAL=1 FT.

ELEVATIONS HEREON ARE NAVD88, DETERMINED BY AN OPUS SOLUTION.

- Denotes existing monument found in place as noted hereon.
- Denotes 3/8" iron pin set with yellow plastic cap stamped CA 828, unless otherwise noted hereon.

POSITIONAL ACCURACY

Unless otherwise noted hereon all monuments established by this survey have a minimum positional accuracy of 0.10 feet.

NOTICE!

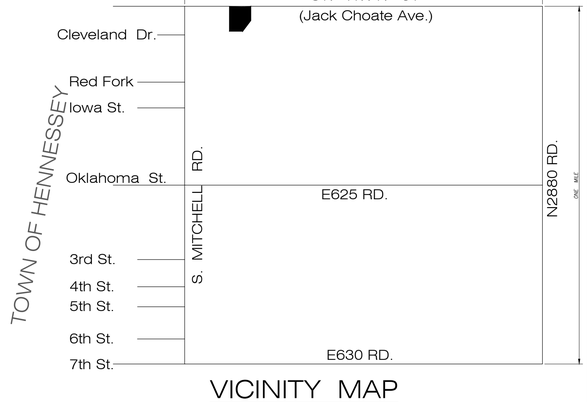
No record title search was performed to determine if subject tract is affected by other easements and or rights-of-way not shown hereon.

SURVEYOR'S OPINION

To the best of my knowledge, information and belief, a prudent survey was made under my supervision of the land shown hereon, which meets or exceeds the Oklahoma Minimum Standards for the Practice of Land Surveys adopted by the Oklahoma State Board of Registration for Professional Engineers and Land Surveyors on Nov. 1, 2020.

UTILITY WARNING

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED EITHER FROM RECORD DOCUMENTS OR FIELD LOCATIONS BY THE OPERATOR OR THEIR AGENTS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED, AND FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM THE INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY EXPOSED THE UNDERGROUND UTILITIES FOR LOCATION.



VICINITY MAP

(Not to Scale)

I, Danny R. Turner, hereby certify that this project was completed under my direct supervision and responsible charge from an actual ground survey performed at the 95% confidence level to meet the Federal Geographic Data Committee Standards. We commenced obtaining the original data on June 9th, 2023 and completed obtaining the data on June 20th, 2023. The vertical data heron is NAVD88(2011), relative to an OPUS solution. The vertical tolerance of the elevations shown hereon is 0.05 hundredths of a foot on hard surfaces and 0.1 tenths of a foot on ground surfaces. This topographic survey meets the requirements of a topographic survey as adopted by the Oklahoma State Board of Licensure for Professional Engineers and Land Surveyors on November 1, 2020

TOPOGRAPHIC AND BOUNDARY SURVEY

HENNESSEY SCHOOL BUS BARN

PART OF NW/4 SEC. 19, T19N, R6W, I.M.

Hennessey, Kingfisher County, Oklahoma

PORTERFIELD SURVEYING, INC.
PROFESSIONAL LAND SURVEYING SERVICES
1306 N. Imo Rd., Enid, Oklahoma 73703
Ph. 580-233-0572, Fax 580-233-0583
E-mail "contact@porterfieldsurveying.com"
C.A. No. 828, Expiration Date: June 30, 2025

REVISIONS

NUMBER	DATE	DESCRIPTION

PROJECT NUMBER: 20230113 HENNESSEY BUS BARN

PROJECT LOCATION: PART OF NW/4 SEC. 19 TOWNSHIP 19 NORTH, RANGE 6 WEST, INDIAN MERIDIAN, KINGFISHER CO.

SHEET TITLE: TOPOGRAPHIC SURVEY

CLIENT: HOLTZEN ENGINEERING GROUP 302 N. INDEPENDENCE, STE. 1100 ENID, GARFIELD COUNTY, OKLAHOMA

SEAL:

DANNY R. TURNER L.P.L.S.-1248

Date of Survey:	6/20/2023
Date Signed:	6/23/2023
Field Book: 5	Page: 34
Scale:	1"=30'
Cad File:	\20230113\BusBarn
Drawn By:	D.R.T
Proofed By:	C.W. & J.W.
Drawing No:	1655
Sheet:	1 of 1

GENERAL STRUCTURAL NOTES

ALL MATERIALS, WORKMANSHIP AND CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH THE STRUCTURAL DRAWINGS, SPECIFICATIONS AND NOTES LISTED BELOW. MINIMUM PROVISIONS OF THE INTERNATIONAL BUILDING CODE, 2018 EDITION, AND LOCAL AMENDMENTS SHALL APPLY WHERE DETAILS ARE NOT SHOWN OR DESCRIBED. OTHER APPLICABLE CODES AND STANDARDS ARE GIVEN BELOW.

DESIGN LOADS

UNIFORM DEAD LOADS AND LIVE LOADS	
1. DEAD LOADS	BUILDING MATERIALS
2. COLLATERAL LOADS (TOTAL)	5 PSF
- MECHANICAL & ELECTRICAL ALLOWANCE	5 PSF
3. ROOF LIVE LOADS	20 PSF (REDUCIBLE T0 15 PSF)
4. LATERAL ACTIVE SOIL PRESSURE (E.F.P.)	60 PSF/FT
6. LATERAL PASSIVE SOIL PRESSURE (E.F.P.)	200 PSF/FT

ROOF SNOW LOADS	
1. GROUND SNOW LOAD, Pg	10 PSF
2. FLAT-ROOF SNOW LOAD, Pf	8.4 PSF
3. SNOW EXPOSURE FACTOR, Ce	1.0
4. SNOW LOAD IMPORTANCE FACTOR, Is	1.0
5. THERMAL FACTOR, Ct	1.2

WIND DESIGN DATA	
1. ULTIMATE WIND SPEED	115 MPH
2. NOMINAL WIND SPEED	89 MPH
3. RISK CATEGORY	II
4. WIND EXPOSURE CATEGORY	C
5. INTERNAL PRESSURE COEFFICIENT	+/-0.18
6. COMPONENT & CLADDING PRESSURE	RE: SCHEDULE

EARTHQUAKE DESIGN DATA	
1. RISK CATEGORY	II
2. SEISMIC IMPORTANCE FACTOR	1.0
3. MAPPED SPECTRAL RESPONSE ACCELERATIONS	Ss= 0.198, S1= 0.066
4. SITE CLASS	C
5. DESIGN SPRECTRAL RESPONSE ACCELERATIONS	SDS= 0.158, SD1= 0.075
6. SEISMIC DESIGN CATEGORY	B
7. BASIC SEISMIC-FORCE RESISTING SYSTEM	STEEL SYSTEM NOT SPECIFICALLY DETAILED FOR SEISMIC RESISTANCE, EXCLUDING CANTILEVER COLUMN SYSTEMS
8. RESPONSE MODIFICATION FACTOR, R	3
9. SEISMIC RESPONSE COEFFICIENT, Cs	0.053
10. DESIGN BASE SHEAR	0.053W
11. ANALYSIS PROCEDURE USED	EQUIVALENT LATERAL FORCE

GENERAL NOTES

1. THE STRUCTURAL DRAWINGS DEPICT THE STRUCTURE IN ITS FINAL CONSTRUCTED CONFIGURATION.
2. NEITHER CONSTRUCTION MEANS AND METHODS, TECHNIQUES, CONSTRUCTION SEQUENCE NOR CONSTRUCTION SAFETY ARE PART OF THE STRUCTURAL ENGINEER'S RESPONSIBILITY OR SCOPE OF WORK.
3. THE GENERAL CONTRACTOR AND HIS SUBCONTRACTORS ARE FULLY RESPONSIBLE FOR THE MEANS AND METHODS WHICH INCLUDE CONSTRUCTION BRACING AND TEMPORARY SUPPORTS USED TO CONSTRUCT THE STRUCTURE AND FOR FULL COMPLIANCE WITH ALL JOB SAFETY RELATED REGULATIONS AND CONDITIONS AT THE SITE.
4. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING TEMPORARY LATERAL BRACING FOR STRUCTURAL STABILITY. TEMPORARY BRACING SHALL REMAIN IN PLACE UNTIL PERMANENT BRACING, ROOF AND FLOOR DIAPHRAGMS, AND WALL ARE COMPLETELY INSTALLED AND ALL CONNECTIONS COMPLETED.
5. THE GENERAL CONTRACTOR SHALL BE RESPONSIBLE DURING ERECTION OF THE BUILDING ADDITIONAL TEMPORARY SHORING, BRACING, FORMING, GUYING, VERTICAL SUPPORTS, ETC... TO STABILIZE THE STRUCTURE, HOLD THE STRUCTURE IN PROPER ALIGNMENT, AND TO WITHSTAND CONSTRUCTION LOADING.
6. OBSERVATION SITE VISITS, IF ANY BY STRUCTURAL ENGINEER OR A REPRESENTATIVE OF THE STRUCTURAL ENGINEER SHALL NOT INCLUDE INSPECTIONS, SPECIAL INSPECTIONS, SAFETY INSPECTIONS, NOR REVIEW OR INSPECTIONS OF CONSTRUCTION MEANS AND METHODS. OBSERVATION SITE VISITS ARE SOLELY FOR THE PURPOSE OF ASSISTING WITH ACHIEVING CONFORMANCE WITH CONTRACT DOCUMENTS, BUT DO NOT GUARANTY CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.
7. ALL DETAILS ARE TYPICAL UNLESS NOTED OTHERWISE. DETAILS SHALL APPLY TO ALL SIMILAR AND LIKE CONDITIONS.
8. CRANES, CONCRETE TRUCKS, AND ALL OTHER HEAVILY LOADED VEHICLES ARE NOT TO BE DRIVEN ACROSS FOUNDATION MEMBERS NOR BUILDING SLABS. VEHICLES DRIVEN ON BUILDINGS SLABS ARE AT THE RISK OF THE GENERAL CONTRACTOR.
9. THE GENERAL CONTRACTOR SHALL COORDINATE ALL FLOOR AND ROOF PENETRATIONS WITH ARCHITECTURAL DRAWINGS, AND MECHANICAL, PLUMBING, AND ELECTRICAL DRAWINGS.
10. IF GENERAL STRUCTURAL NOTES OR PLANS CONFLICT WITH THE SPECIFICATIONS THE MORE STRINGENT SHALL CONTROL.

FOUNDATIONS

FOUNDATION DESIGNS ARE BASED ON RECOMMENDATIONS CONTAINED IN A SUBSURFACE EXPLORATION REPORT PREPARED BY BURGESS ENGINEERING AND TESTING, DATED JULY 5, 2023. BET INC. PROJECT NO.: 731-23084. H.E.G. IS NOT RESPONSIBLE OR LIABLE FOR THE ACCURACY OF THE INFORMATION PRENTED IN THE GEOTECHNICAL REPORT.

FOOTING FOUNDATIONS

1. MAXIMUM NET ALLOWABLE SOIL BEARING PRESSURE:
   SPREAD FOOTING = 2,000 PSF
   CONTINUOUS FOOTING = 1,400 PSF
2. FOOTINGS SHALL BEAR A MINIMUM OF 2'-0" BELOW FINISHED EXTERIOR GRADE AND ON APPROVED MATERIAL IN ACCORDANCE WITH THE SOILS REPORT.
3. PROTECT BOTTOMS OF EXCAVATION AGAINST FROST AND KEEP FREE OF WATER, DEBRIS AND LOOSE MATERIAL. SOIL BECOMING UNSUITABLE FOR BEARING MUST BE REMOVED.
4. PROTECTIVE MEASURES SHALL BE TAKEN BY THE CONTRACTOR TO PREVENT MOISTURE CHANGE IN FOOTING EXCAVATIONS.
5. EXCESS EXAVATION BELOW FOOTINGS SHALL BE FILLED WITH LEAN CONCRETE.

EARTHWORK

1. EARTHWORK AND SUBGRADE CONSTRUCTION AND INSPECTIONS SHALL BE IN STRICT ACCORDANCE WITH THE RECOMMENDATIONS CONTAINED IN THE SOILS REPORT.
2. PRIOR TO THE PLACEMENT OF FILL, THE EXISTING SUBGRADE SHALL BE:
   A. STRIPPED OF ALL VEGETATION, TOPSOIL, AND ANY OTHER DELETERIOUS MATERIALS.
   B. PROOF-ROLL INCLUDING REMOVING AND REPLACING ANY SOFT MATERIAL WHICH EXHIBITS RUTTING OR DEFFLECTS EXCESSIVELY WHEN TRAVERSED BY A LOADED TRUCK WITH A REAR AXLE LOADED OF APPROXIMATELY 16,000 lbs.
   C. SCARIFIED TO A DEPTH OF (6) INCHES, AND MOISTURE CONDITIONED (0% TO +3% OF OPTIMUM) AND COMPACTED TO 95 PERCENT OR MORE OF STANDARD PROCTOR MAXIMUM DRY DENSITY.
3. COMPACTION SHALL BE EXTENDED 5 FT. BEYOND THE BUILDING FOOTPRINT.
4. ALL FILL AND NATURAL GRADES (FOR THE CASE WHERE NO FILL IS USED) IN THE BUILDING AREA SHALL BE:
   A. COMPACTED TO AT LEAST 98 PERCENT OF STANDARD PROCTOR MAXIMUM DRY DENSITY (ASTM D698) AT A MOISTURE CONTENT AT OR SLIGHTLY IN EXCESS OF THE OPTIMUM (0% TO +3% OF OPTIMUM).
   B. PLACED IN LIFTS NOT TO EXCEED (9) INCHES IN COMPACTED THICKNESS.
   C. TESTED FOR FIELD DENSITY EVERY 5,000 S.F. PER LIFT UNDER STRUCTURE WITH A MINIMUM OF (3)-TESTS PER LIFT.
5. STRUCTURAL FILL REQUIREMENTS:
   A. AMOUNT FINER THAN 2-INCH SIEVE = 100%
   B. AMOUNT FINER THAN NO. 200 SIEVE = 12% MINIMUM, AND IF P.I ≤ 7, 60% MAXIMUM.
   C. LIQUID LIMIT = 35 MAXIMUM
   D. PLASTICITY INDEX (P.I.) = 5 TO 15
6. SIX (6) INCHES OR MORE OF GRANULAR BASE, MEETING THE FOLLOWING REQUIREMENTS, SHALL BE PLACED OVER THE SUBGRADE:
   A. GRAVEL, FREE OF SHARP CORNERS OR EDGES, NATURAL STONE, WASHED, FREE OF CLAY, SHALE, ORGAINIC MATTER
   B. MINIMUM SIZE = 1/4"
   C. MAXIMUM SIZE = 5/8"
7. SUBGRADE MOISTURE SHALL BE MAINTAINED UNTIL CONCRETE SLAB IS POURED.
8. THE CONTRACTOR SHALL CONTRACT WITH A QUALIFIED SOILS ENGINEER TO PERFORM TESTING, INSPECT THE FOOTING EXCAVATIONS, PROOF-ROLLING, AND COMPACTION TO VERIFY THE BEARING MATERIAL AND IDENTIFY SOFT AND YEILDING AREAS ON THE SITE.

UTILITY TRENCH BACKFILL

1. CONSTRUCT AN EFFECTIVE CLAY TRENCH PLUG AT ALL UTILITY TRENCHES THAT PENETRATE BENEATH THE BUILDING OR THROUGH A PERIMETER FOOTING.
2. CLAY PLUG SHALL COMPLETELY SURROUND UTILITY LINE, EXTEND 5-FEET FROM FACE OF EXTERIOR PERIMETER FOOTING.
3. COMPACTED CLAY PLUG AT A WATER CONTENT ABOVE OPTIMUM.
4. BACKFILL, COMPACT, AND TEST UTILITY TRENCHES AS OUTLINED IN SOILS REPORT.

CAST-IN-PLACE CONCRETE

GENERAL:

1. ALL CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH ACI 304, ACI318, AND ACI347.
2. DO NOT ADD WATER TO CONCRETE DURING PLACEMENT.
3. ALL CONCRETE SHALL BE MADE WITH STONE AGGREGATE AND SHALL DEVELOP THE FOLLOWING 28 DAY COMPRESSIVE STRENGTH (f'c'):
   A. CONTINUOUS AND SPREAD FOOTINGS: 3,000 PSI (A.E.)
   B. SLAB-ON-GRADE: 3,500 PSI
   C. EXTERIOR WALKS: 3,500 PSI (A.E.)
4. REFER TO SPECIFICATIONS FOR CONRETE MIX DESIGN REQUIREMENTS.
5. WATER REPELANT: BASF RHEOMIX 225 ADDED PER MANUFACTURERS RECOMENDATION (SLAB-ON-GRADE ONLY)
6. ADDITION OF ANY ADMIXTURES SHALL BE APPROVE BY THE PROJECT STRUCTURAL ENGINEER.
7. VAPOR RETARDER SHALL MEET ASTM E 1745, CLASS A, AND REQUIREMENTS BELOW (UNLESS STATED OTHERWISE IN THE SPECIFICATIONS OR ARCHITECTURAL DRAWINGS)
   A. INSTALL PER MANUFACTURER'S RECOMMENDATION (USE MANUFACTURERS RECOMMENDED TAPE)
   B. STEGO INDEUSTRIES, LLC;. STEGO WRAP (10 MIL CLASS A) OR EQUAL, UNLESS MORE STRINGENT REQUIREEMNTS ARE SPECIFIED BY THE ARCHITECT OR IN THE SPECIFICATIONS.

REINFORCING:

1. CONCRETE POURED AGAINST EARTH = 3"
2. CONCRETE POURED IN FORMS BUT EXPOSED TO WEATHER OR EARTH:
   A. IF BARS ARE LARGER THAN #5 = 2"
   B. IF BARS ARE #5 OR SMALLER = 1 1/2"
3. CONCRETE NOT EXPOSED TO WEATHER OR EARTH:
   A. STRUCTURAL SLABS AND WALLS = 3/4"
4. ALL BAR LENGTHS TO SCALE UNLESS NOTED OTHERWISE. REFER TO CONCRETE LAP SPLICES SCHEDULED FOR SPLICE LENGTHS OR AS SHOWN ON DRAWINGS WHICHEVER IS GREATER. PROVIDE CORNER BARS AT WALL FOOTING AND GRADE BEAM CORNERS, AND INTERSECTIONS. SIZE AND SPACING SHALL MATCH HORIZONTAL BARS.
5. PROVIDE ALL ACCESORIES NECESSARY TO SUPPORT REINFORCING AT POSITIONS SHOWN ON THE PLANS IN ACCORDANCE WITH THE LATEST ACI DETAILING MANUAL.
6. REINFORCING BARS, HAIRPINS, AND TIE RODS/TIE BEAM REINFORCING SHALL CONFORM TO THE ASTM A615 GRADE 60. DO NOT WELD OR REBEND REINFORCING, UNLESS NOTED OTHERWISE.
7. STIRRUPS SHALL CONFORM TO ASTM A615 GRADE 40. DO NOT WELD OR REBEND.
8. ONLY ASTM A706 GRADE 60 REINFORCING BARS MAY BE WELDED AND WELDING SHALL CONFORM TO THE LATEST EDITION OF AWS D1.4.
9. WIRE MESH REINFORCEMENT SHALL CONFORM TO ASTM A185. LAP ONE FULL MESH AT SIDE AND END LAPS AND WIRE TOGETHER. PLACE MESH AT MID-DEPTH OF SLAB.
10. PROVIDE SLEEVES FOR ALL PIPES PLACED THROUGH CONCRETE WALLS OR SLABS. NO OPENINGS OTHER THAN THOSE SHOWN ON THE STRUCTURAL DRAWINGS WILL BE PERMITTED, UNLESS ARCHITECT/ENGINEER'S APPROVAL IS SECURED PRIOR TO PLACEMENT OF REINFORCING STEEL.
11. REFER TO MECHANICAL AND PLUMBING DRAWINGS FOR OPENINGS, PROVIDE REINFARCING BARS AT CORNERS AND EDGES OF OPENINGS AND PENETRATIONS IN ACCORDANCE WITH TYPICAL DETAILS.
12. VERTICAL CONSTRUCTION JOINTS IN FOOTINGS AND GRADE BEAMS SHALL BE LOCATED WHERE APPROVED BY ARCHITECT/ENGINEER

ANCHOR BOLTS

1. CAST-IN-PLACE ANCHOR BOLTS SHALL CONFORM TO THE FOLOWING UNLESS NOTED OTHERWISE.
   A. STEEL COLUMN AND STEEL BEAM-TO-CONCRETE/CMU ANCHOR BOLTS SHALL BE PLACED PRIOR TO CONCRETE INSTALLATION. WET-SET STEEL COLUMN AND STEEL BEAM-TO-CONCRETE/CMU ANCHOR BOLTS ARE PROHIBITED, CAST-IN-PLACE ANCHOR BOLTS SHALL NOT BE INSTALLED AFTER CONCRETE IS POURED. ANCHOR BOLT TEMPLATE SHALL BE USED TO HOLD ANCHOR BOLTS IN PLACE.
   B. HEADED ANCHOR BOLTS: ASTM F1554 GRADE 36, Fy= 36 KSI, Fu= 58 KSI
   C. STEEL PLATE WASHERS: ASTM A36
   D. BENT L-BOLTS OR J-BOLTS SHALL NOT BE USED WITH STEEL COLUMNS, OR STEEL BEAM-TO-CONCRETE/CMU CONNECTIONS.

METAL BUILDING COMPONENTS

1. METAL BUILDING SUPPLIER SHALL FURNISH ALL TRIM, FLASHING, CLOSURES, TAPE SEALANTS, TUBE SEALANTS, FASTNERS, ECT. TO PROVIDE A COMPLETE AND WEATHER TIGHT STRUCTURE.
2. METAL BUILDING SYSTEM SHALL SATISFY ALL U.L. 90 REQUIREMENTS FOR UPLIFT.
3. METAL BUILDING MAIN FRAME INCLUDING METAL BUILDING COMPONENTS SHALL BE DESIGNED FOR THE LOADS SHOWN ON THE DESIGN CRITERIA. SNOW DRIFT LOADS AS SHOWN ON DRAWINGS AND UNBALANCED SNOW LOADS SHALL BE CONSIDERED.
4. METAL BUILDING MAIN FRAME AND COMPONENTS SHALL BE DESIGNED FOR PARTIAL SNOW LOADING PER ASCE 7-16 SECTION 7.5.
5. METAL BUILDING MAIN FRAME SHALL BE TAPERED OR STRAIGHT COLUMNS (UNLESS NOTED OTHERWISE IN THE CONSTRUCTION PLANS OR SPECIFICATIONS) WITH TAPERED BEAMS WITH INTERIOR SUPPORTING COLUMNS WHERE SHOWN ON PLANS. INTERIOR SUPPORT COLUMNS SHALL BE DESIGN AS PINNED-PINNED COLUMNS AND ARE NOT INCLUDED IN THE LATERAL FORCE RESISTING SYSTEM (UNLESS SPECIFICALLY NOTED NOT THE PLANS). MAIN FRAME COLUMN TO BEAM CONNECTION SHALL BE DESIGNED TO RESIST MOMENTS DUE TO GRAVITY LOADS, WIND AND EARTHQUAKE LOADS PARALLEL TO THE FRAMES. ROD X-BRACING OR PORTAL FRAMES SHALL BE USED TO RESIST LATERAL LOADS PERPENDICULAR TO MAIN FRAMES. LOCATIONS SHALL BE COORDINATED AND APPROVED BY THE ARCHITECT/ENGINEER PRIOR TO CONSTRUCTION AND SHALL NOT OBSTRUCT ARCHITECTURAL FEATURES.
6. METAL BUILDING DETAILS HAVE BEEN SHOWN SCHEMATICALLY, FINAL DETAILING IS THE RESPONSIBILITY OF THE METAL BUILDING MANUFACTURER.
7. MAIN FRAMES AND PURLINS SHALL BE DESIGNED AND SIZED TO SUPPORT THE WEIGHT OF MECHANICAL EQUIPMENT SHOWN ON THE ARCHITECTURAL AND/OR M.E.&P. PLANS.
8. ALL COLUMN CONNECTIONS TO THE FOUNDATION SHALL BE DESIGNED AS A PINNED CONNECTION, FIXED CONNECTIONS TO FOUNDATION ARE NOT PERMITTED, UNLESS SPECIFICALLY IDENTIFIED ON THE PLANS.
9. ALL OVERHEAD DOORS, DOORS, AND WINDOWS SHALL BE DESIGNED FOR WIND LOADS SHOWN IN WIND DESIGN DATA.
10. COLUMNS NOTED AS 'END WALL COLUMNS' ARE INTENDED TO BE PART OF THE VERTICAL AND OUT-OF-PLANE LATERAL SUPPORT OF THE END WALL FRAMING.
11. COLUMNS NOTED AS 'WIND COLUMNS, ARE INTENDED TO RESIST OUT-OF-PLANE LATERAL WALL LOADS AND ARE NOT INTENDED TO BE PART OF THE VERTICAL LOAD RESISTING SYSTEM OF THE END MAIN FRAME. WIND COLUMNS ARE ONLY TO TRANSFER LATERAL LOADS TO THE ROOF DIAPHRAGM/BRACING AND FOUNDATION. THE END MAIN FRAME WHERE THESE COLUMNS EXIST SHALL NOT BE STRUCTURALLY DEPENDENT ON THESE COLUMNS.
12. ALL HANGERS CONNECTED TO AND/OR SUPPORTED BY METAL BUILDING COMPONENTS SHALL BE REVIEWED AND APPROVED BY THE METAL BUILDING MANUFACTURER.
13. METAL BUILDING MANUFACTURER SHALL LIMIT DEFLECTION OF COMPONENTS AS FOLLOWS:
    - PURLINS (VERTICAL) L/180 TOTAL LOAD L/240 LIVE LOAD
    - RAFTERS (VERTICAL) L/180 TOTAL LOAD L/240 LIVE LOAD
    - GIRTS (HORIZONTAL) L/180
    - BUILDING LATERAL DRIFT H/90

FOUNDATION DESIGN:
THE METAL BUILDING REACTIONS USED FOR FOUNDATION DESIGN ARE PRELIMINARY. ENGINEER SHALL REVIEW METAL BILDING SHOP DRAWINGS AND PROVDED METAL BUILDING COLUMN REACTIONS PRIOR TO FOUNDATION CONSTRUCTION. CONTRACTOR SHALL PROVIDE A COST PER CUBIC YARD AND COST PER POUND OF REINFORCING STEEL WHICH SHALL BE USED FOR DETERMINING INCREASED FOOTINGS COSTS.

EXISTING CONDITIONS

1. DRAWINGS ARE ONLY AN APPROXIMATION OF EXISTING CONDITIONS.
2. CONTRACTOR SHALL SATISFY HIMSELF AND FIELD VERIFY EXISTING CONDITIONS AND EXTENT OF NEW WORK TO BE COMPLETED BEFORE SUBMITTING BID.
3. CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING DIMENSIONS, DEPTHS, ELEVATIONS, AND ANY OTHER REQUIRED INFORMATION FOR CONSTRUCTION.
4. CONTRACTOR SHALL COORDINATE FIELD VERIFIED INFORMATION WITH FABRICATORS PRIOR TO ANY CONSTRUCTION TAKING PLACE.
5. INFORM ARCHITECT OF ANY CONFLICTS WITH NEW AND EXISTING CONSTRUCTION AS SHOWN OR DETAILED.

SPECIAL INSPECTIONS

THE OWNER SHALL EMPLOY SPECIAL INSPECTORS WHO SHALL PROVIDE INSPECTION FOR THE TYPES OF WORK LISTED IN IBC SECTION 1704 FOR THE IS PROJECT. SPECIAL INSPECTIONS DO NOT REPLACE INSPECTIONS AND MATERIAL TESTING REQUIRED BY THE CONTRACTOR. REFER TO SHEET S1.1 FOR ADDITIONAL INFORMATION.

ABBREVIATIONS

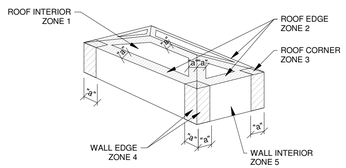
A.F.F.	ABOVE FINISHED FLOOR	J.B.	JOIST BEARING
A.E.	AIR ENTRAINED	K	KIPS
A.B.	ANCHOR BOLT	L	LENGTH
ACI	AMERICAN CONCRETE INSTITUTE	LAP	LAP SPLICE LENGTH
AISC	AMERICAN INSTITUE OF STEEL CONSTRUCTION	Ldh	DEVELOPMENT LENGTH FOR HOOKED REINF.
ALT.	ALTERNATE	Lt	LENGTH OF REINFORCING HOOK
APA	AMERICAN PLYWOOD ASSOCIATION	LT. WT.	LIGHT WEIGHT
ARCH	ARCHITECTURAL DRAWINGS	L-OR-L.L	LIVE LOAD
AWS	AMERICAN WELDING SOCIETY	LLH	LONG LEG HORIZONTAL
BM.	BEAM	LLV	LONG LEG VERTICAL
B.O.B.	BOTTOM OF BEAM	LONG	LONGITUDINAL
B.O.D.	BOTTOM OF DECK	MAT'S	MATERIAL
B.O.F.	BOTTOM OF FOOTING	MAX.	MAXIMUM
B.O.S.	BOTTOM OF STEEL	MECH.	MECHANICAL
BOT.	BOTTOM	MEZZ.	MEZZANINE
B.N.	BOUNDARY NAILING	MFR.	MANFACTURER
BRG.	BEARING	MIN.	MINIMUM
BLDG.	BUILDING	MPH	MILES PER HOUR
CANT.	CANTILEVER	MISC	MISCELLANEOUS
C.L.	CENTERLINE	MTL.	METAL
CLR.	CLEAR	N.S.	NEAR SIDE
C.J.	CONTROL OR CONSTRUCTION JOINT	N.T.S.	NOT TO SCALE
CMU	CONRETE MASONRY UNIT	O.C.	ON CENTER
COL.	COLUMN	OPP	OPPOSITE
C.F.S.	COLD-FORMED STEEL	O.S.B.	ORIENTED STRAND BOARD
CONC.	CONCRETE	O.W.S.J.	OPEN WEB STEEL JOIST
CONN.	CONNECTION	P.A.F.	POWDER ACTUATED FASTENER
CONST.	CONSTRUCTION	PL.	PLATE
CONT.	CONTINUOUS	P.T.	PRESSURE TREATED -OR- POST TENSIONED
D.B.A.	DEFORMED BAR ANCHOR	QTY.	QUANTITY
DBL.	DOUBLE	REINF.	REINFORCEMENT
D OR D.L.	DEAD LOAD	REQD.	REQUIRED
DIA	DIAMETER	R.S.	RING SHANK (DEFORMED SHANK)
D.F.(S)	DOUGLAS FIR (SOUTH)	RLL-OR Lr	ROOF LIVE LOAD
DWGS	DRAWINGS	RTU	ROOF TOP UNIT
DWL.	DOWEL	SCHED.	SCHEDULE
EA.	EACH	SDS	SELF DRILLING SCREW
E.W.	EACH WAY	SIM.	SIMILAR
E.N.	EDGE NAILING	S-OR-S.L.	SNOW LOAD
ELEV.	ELEVATION	S.P.	SOUTHERN PINE
EX.	EXISTING	SPECS.	SPECIFICATIONS
EXIST.	EXISTING	S.O.G.	SLAB-ON-GRADE
EXP.	EXPANSION	SQ.	SQUARE
EXT	EXTERIOR	STD.	STANDARD
f'c	CONCRETE COMPRESSIVE STRENGTH	STIFF.	STIFFENER
f'm	CONRETE MASONRY COMPRESSIVE STRENGTH	T&B.	TOP AND BOTTOM
F.F.	FINISH FLOOR	T.O.F.	TOP OF FOOTING
FND.	FOUNDATION	T.O.M.	TOP OF MASONRY
F.S.	FAR SIDE	T.O.S.	TOP OF STEEL, TOP OF STUD
FT.	FEET	T.O.W.	TOP OF WALL
FTG.	FOOTING	T.P.	TIE PLATE
GA.	GAGE OR GAUGE	TRANS.	TRANSVERSE
GALV.	GALVANIZED	TYP.	TYPICAL
H.E.G.	HOLTZEN ENGINEERING GROUP, P.C.	VERT.	VERTICAL
H.S.A.	HEADED STUD ANCHOR	V.I.F.	CERIFY IN FIELD
HORIZ.	HORIZONTAL	W	WIDE FLANGE DESIGNATION
HSS	HOLLOW STEEL SECTION	W.W.F.	WELDED WIRE FABRIC
IN.	INCH	W/	WITH
INFO.	INFORMATION	W/OUT	WITHOUT
INSUL.	INSULATION		
INT.	INTERIOR		

COMPONENT AND CLADDING WIND PRESSURES

ZONE	DESCRIPTION	EFFECTIVE WIND AREA		
		10 S.F.	50 S.F.	100 S.F.
1	ROOF INTERIOR	+12/-30	+10/-28	+9/-27
2	ROOF EDGE	+12/-49	+10/-37	+9/-32
3	ROOF CORNER	+12/-74	+10/-44	+9/-32
4	WALL INTERIOR	+27/-29	+24/-26	+23/-25
5	WALL EDGE	+27/-36	+24/-30	+23/-28

NOTES:

1. EDGE/CORNER PRESSURES ZONES LENGTH "a"=6'-5" FROM EDGES.
2. LINEAR INTERPOLATION IS PERMITTED FOR EFFECTIVE WIND AREA BETWEEN 10 S.F. AND 100 S.F.
3. PRESSURES ARE NORMAL TO THE SURFACE.
4. PLUS AND MINUS SIGNS SIGNIFY PRESSURES ACTING TOWARD AND AWAY FROM THE SURFACES, RESPECTIVELY.



COMPONENT & CLADDING SCHEMATIC

STRUCTURAL SHEET INDEX

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S1.1	SPECIAL INSPECTIONS
S1.2	TYPICAL DETAILS
S2.0	FOUNDATION/ ROOF RAMING PLAN
S3.0	DETAILS

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CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS

HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

GENERAL STRUCTURAL NOTES

DATE: 8/10/2023

SHEET NUMBER

S1.0

TABLE 1705.6 REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. VERIFY MATERIALS BELOW SHALLOW FOUNDATIONS ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY	-	X
2. VERIFY EXCAVATIONS ARE EXTENDED TO PROPER DEPTH AND HAVE REACHED PROPER MATERIAL	-	X
3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS	-	X
4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESS DURING PLACEMENT AND COMPACTION OF COMPACTED FILL	X	-
5. PRIOR TO PLACEMENT OF COMPACTED FILL, INSPECT SUBGRADE AND VERIFY THAT SITE HAS BEEN PREPARED PROPERLY	-	X

TABLE 1705.3 REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD (a)	IBC REFERENCE
1. INSPECT REINFOREMENT, INCLUDING PRESTRESSING TENDONS, AND VERIFY PLACEMENT.	-	X	ACI 318 CH. 20, 25.2, 25.3, 26.6.1-26.6.3	1908.4
2. INSPECT ANCHORS CAST IN CONCRETE	-	X	ACI 318: 17.8.2	-
3. INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS(b)				
A. ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINE ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS	X		ACI 318: 17.8.2.4	-
B. MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 4.A.		X	ACI 318, 17.8.2	
4. VERIFY USE OF REQUIRED DESIGN MIX	-	X	ACI 318: CH. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
5. PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE	X	-	ASTM C172 ASTM C31 ACI 318: 26.4,...	1908.10
6. INSPECT CONCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES	X	-	ACI 318: 26.5	1908.6, 1908.7, 1908.8
7. VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES	-	X	ACI 318: 26.5.3-26.5.5	1908.9
8. INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	-	X	ACI 318: 26.11.1.2(b)	-

(a) WHERE APPLICABLE, SEE ALSO SECTION 1705.12, SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE.
(b) SPECIFIC REQUIREMENTS FOR SPECIAL INSPECTION SHALL BE INCLUDED IN THE RESEARCH REPORT FOR THE ANCHOR ISSUED BY AN APPROVED SOURCE IN ACCORDANCE WITH 17.8.2 IN ACI 318, OR OTHER QUALIFICAITON PROCEDURES. WHERE REQUIREMENTS ARE NOT PROVIDED, SPECIAL INSPECTION REQUIREMENTS SHALL BE SPECIFIED BY THE REGISTERED DESIGN PROFESSIONAL AND SHALL BE APPROVED BY THE BUILDING OFFICIAL PRIOR TO THE COMMENCEMENT OF THE WORK.

STRUCTURAL STEEL - TABLE N5.4-1 INSPECTION TASKS PRIOR TO WELDING.

INSPECTION TASKS PROR TO WELDING	QC	QA
1. WELDING PROCEDURE SPECIFICATIONS (WPSs) AVAILABLE	P	P
2. MANUFACTURER CERTIFICATIONS OF WELDING CONSUMABLES AVAILABLE	P	P
3. MATERIAL IDENTIFICATION (TYPE/GRADE)	O	O
4. WELDER IDENTIFICATION SYSTEM (1)	O	O
5. FIT-UP GROOVE WELDS (INCLUDING JOINT GEOMETRY) - JOINT PREPARATION - DIMENSIONS (ALIGNMENT, ROOT OPENING, ROOT FACE, BEVEL) - CLEANLINESS (CONDITION OF STEEL SURFACES) - TACKING (TACK WELD QUALITY AND LOCATION) - BACKING TYPE AND FIT (IF APPLICABLE)	O	O
6. CONFIGURATION AND FINISH OF ACCESS HOLES	O	O
7. FIT-UP OF FILLET WELDS - DIMENSIONS (ALIGNMENT, GAPS AT ROOT) - CLEANLINESS (CONDITION OF STEEL SURFACES) - TACKING (TACK WELD QUALITY AND LOCATION)	O	O
8. CHECK WELDING EQUIPMENT	O	-

(1) THE FABRICATOR OR ERECTOR, AS APPLICABLE, SHALL MAINTAIN A SYSTEM BY WHICH A WELDER WHO HAS WELDED A JOINT OR MEMBER CAN BE IDENTIFIED. STAMPS, IF USED, SHALL BE THE LOW-STRESS TYPE.
O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.
P - PERFORM THESE TASKS FOR EACH WELDED JOINT OR MEMBER

STRUCTURAL STEEL - TABLE N5.4-2 INSPECTION TASKS DURING WELDING.

INSPECTION TASKS DURING WELDING	QC	QA
1. USE OF QUALIFIED WELDERS	O	O
2. CONTROL AND HANDLING OF WELDING CONSUMABLES - PACKING - EXPOSURE CONTROL	O	O
3. NO WELDING OVER CRACKED TACK WELDS	O	O
4. ENVIROMENTAL CONDITIONS - WIND SPEED WITHIN LIMITS - PRECIPITAION AND TEMPERATURE	O	O
5. WPS FOLLOWED - SETTINGS ON WELDING EQUIPMEN - TRAVEL SP - SELECTED WELDING MATERIAL - SHIELDED GAS TYPE/FLOW RATE - PREHEAT APPLIED - INTERPASS TEMPERATURE MAINTAINED (MIN./MAX.) - PROPER POSITION (F, V, H, OH)	O	O
6. WELDING TECHNIQUES - INTERPASS AND FINAL CLEANING - EACH PASS WITHIN PROFILE LIMITAIONS - EACH PASS MEETS QUALITY REQUIREMENTS	O	O

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS
P - PERFORM THESE TAKS FOR EACH WELDED JOINT OR MEMBER

STRUCTURAL STEEL - TABLE N5.4-3 INSPECTION TASKS AFTER WELDING.

INSPECTION TASKS AFTER WELDING	QC	QA
1. WELDS CLEANED	O	O
2. SIZE, LENGTH AND LOCATION OF WELDS	P	P
3. WELDS MEET VISUAL ACCEPTANCE CRITERIA - CRACK PROHBITION - WELD/BASE-METAL FUSION - CRATOR CROSS SECTION - WELD PROFILES - WELD SIZE - UNDERCUT - POROSITY	P	P
4. ARC STRIKES	P	P
5. K-AREA (1)	P	P
6. BACKING REMOVED AND WELD TABS REMOVED (IF REQUIRED)	P	P
7. REPAIR ACTIVITIES	P	P
8. DOCUMENT ACCEPTANCE OR REJECTION OF WELDED JOINT OR MEMBER	P	P

(1) WHEN WELDING OF DOUBLER PLATES, CONTINUITY PLATES OR STIFFENERS HAS BEEN PERFORMED IN THE K-AREA, VISUALLY INSPECTED THE WEB K-AREA WITHIN 3 IN. (75 MM) OF THE WELD
O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.
P - PERFORM THESE TASKS FOR EACH WELDED JOINT OR MEMBER

STRUCTURAL STEEL - TABLE N5.6-1 INSPECTION TASKS PRIOR TO BOLTING

INSPECTION TASKS PROR TO BOLTING	QC	QA
1. MANUFACTURER'S CERTIFICATIONS AVAILABLE FOR THE FASTERNER MATERIALS	O	P
2. FASTENERS MARKED IN ACCORDANCE WITH ASTM REQUIREMENTS	O	O
3. PROPER FASTENERS SELECTED FOR THE JOINT DETAIL (GRADE, TYPE, BOLT LENGTH IF THREADS ARE TO BE EXCLUDED FROM SHEAR PLANE.	O	O
4. PROPER BOLTING PROCEDURE SELECTED FOR JOINT DETAIL	O	O
5. CONNECTING ELEMENTS, INCLUDING THE APPROPRIATE FAYING SURFACE CONDITION AND HOLE PREPARATION, IF SPECIFIED, MEET APPLICABLE REQUIREMENTS	O	O
6. PRE-INSTALLATION VERIFICATION TESTING BY INSTALLATION PERSONNEL OBSERVED AND DOCUMENTED FOR FASTENER ASSEMBLIES AND METHODS USED	P	O
7. PROPER STORAGE PROVIDED FOR BOLTS, NUTS, WASHERS AND OTHER FASTENER COMPONENTS	O	O

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS
P - PERFORM THESE TASKS FOR EACH BOLTED CONNECTION

STRUCTURAL STEEL - TABLE N5.6-2 INSPECTION TASKS DURING BOLTING

INPECTION TASKS DURING BOLTING	QC	QA
1. FASTNER ASSEMBLIES, OF SUITABLE CONDITION, PLACED IN ALL HOLES AND WASHERS (IF REQUIRED) ARE POSITIONED AS REQUIRED	O	O
2. JOINT BROUGHT TO THE SNUG-TIGHT CONDITION PRIOR TO THE PRETENSIONING OPERATION	O	O
3. FASTENER COMPONENT NOT TURNED BY THE WRENCH PREVENTED FROM ROTATING	O	O
4. FASTENERS ARE PRETENSIONED IN ACCORDANCE WITH THE RCSC SPECIFICATION, PROGRESSING SYSTEMATICALLY FROM THE MOST RIGID POINT TOWARD THE FREE EDGES	O	O

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS
P - PERFORM THESE TASKS FOR EACH BOLTED CONNECTION

STRUCTURAL STEEL - TABLE N5.6-3 INSPECTION TASKS AFTER BOLTING

INSPECTION TASKS AFTER BOLTING	QC	QA
1. DOCUMENT ACCEPTANCE OR REJECTION OF BOLTED CONNECTIONS	P	P

O - OBSERVE THESE ITEMS ON A RANDOM BASIS. OPERATIONS NEED NOT BE DELAYED PENDING THESE INSPECTIONS.
P - PERFORM THESE TASKS FOR EACH BOLTED CONNECTION

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23396
8/10/23
OKLAHOMA

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

SPECIAL INSPECTIONS

DATE: 8/10/2023

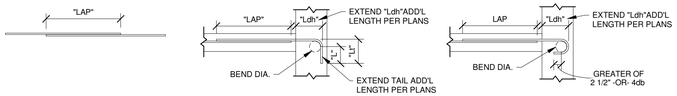
SHEET NUMBER
S1.1

REBAR LAP SPLICE IN CONCRETE						
BAR SIZE	f'c = 3,000 PSI		f'c = 3,500 PSI		f'c = 4,000 PSI	
	TOP	OTHER	TOP	OTHER	TOP	OTHER
#3	28"	22"	26"	20"	24"	19"
#4	37"	29"	34"	27"	32"	25"
#5	47"	36"	43"	33"	40"	31"
#6	56"	43"	52"	40"	48"	37"
#7	81"	63"	75"	58"	70"	54"
#8	93"	72"	86"	66"	80"	62"
#9	105"	81"	97"	74"	90"	70"
#10	116"	89"	107"	83"	100"	77"

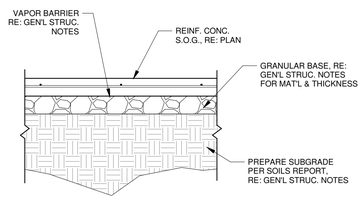
NOTES:
1. TOP BARS ARE HORIZONTAL BARS WITH MORE THAN 12" OF FRESH CONCRETE PLACED BELOW THE HORIZONTAL REINFORCEMENT.
2. LAP SPLICE LENGTHS SHOWN ARE CLASS "B".
3. SPLICE LENGTHS ARE FOR REINFORCING WITH Fy=60,000 PSI.
4. SPLICE LENGTHS ARE FOR NORMAL WEIGHT CONCRETE, INCREASE BY 33% FOR LIGHTWEIGHT CONCRETE

REBAR STANDARD HOOKS IN CONCRETE							
BAR SIZE	STD. HOOK LENGTH 'L'		BEND DIA.	90° HOOK TAIL LENGTH (W/ BEND) "Lt"	DEVELOPMENT LENGTH (Ldh) PER CONCRETE STRENGH (f'c)		
	90°	180°			3,000 PSI	3,500 PSI	4,000 PSI
#3	4 1/2"	2 1/2"	2 1/4"	6"	8 1/4"	8"	7"
#4	6"	2 1/2"	3"	8"	11"	10"	9 1/2"
#5	7 1/2"	2 1/2"	3 3/4"	10"	14"	13"	12"
#6	9"	3"	4 1/2"	12"	16 1/2"	15 1/2"	14 1/2"
#7	10 12"	3 1/2"	5 1/4"	14"	19"	18"	17"
#8	12"	4"	6"	16"	22"	20 1/2"	19"
#9	13 1/2"	4 1/2"	9"	19 1/8"	25"	23"	21 1/2"
#10	15"	5"	10"	21 1/4"	27 1/2"	25 1/2"	24"

NOTES:
1. DEVELOPMENT LENGTHS ARE FOR NORMAL WEIGHT CONCRETE, INCREASE BY 33% FOR LIGHTWEIGHT CONCRETE
2. DEVELOPMENT LENGTHS ARE FOR REINFORCING WITH Fy=60,000 PSI.

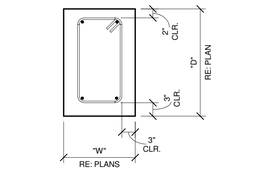


1 CONCRETE REINFORCING LAP SPLICE AND STANDARD HOOK DETAILS & SCHEDULE
N.T.S.

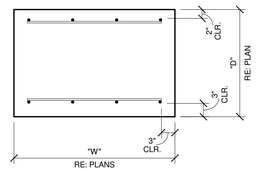


FLOOR SLAB-ON-GRADE

2 TYPICAL BUILDING PAD SECTION
N.T.S.

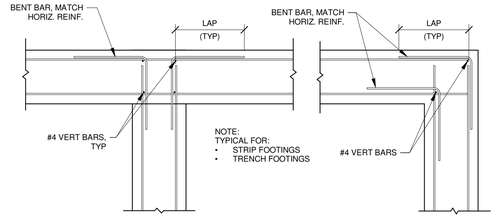


TRENCH FOOTING - TYPICAL

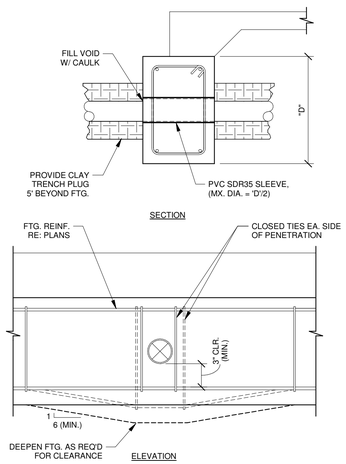


CONTINUOUS FOOTING OR SPREAD FOOTING - TYPICAL

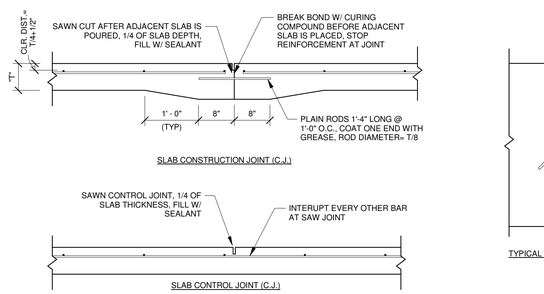
3 TYPICAL FOOTING REBAR CLEAR DISTANCE
N.T.S.

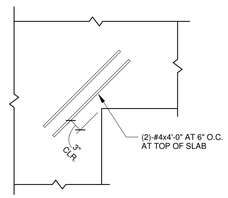


4 TYPICAL CONTINUOUS FOOTING CORNER REINFORCING
N.T.S.



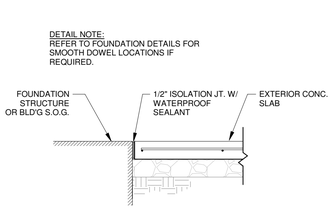
5 TYPICAL FOOTING PENETRATION DETAIL
N.T.S.



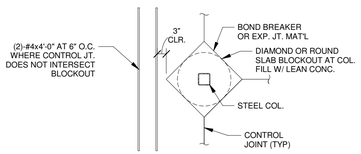


TYPICAL RE-ENTRANT CORNER DETAIL

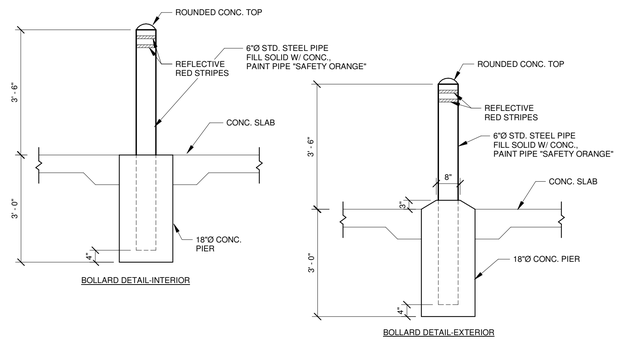
6 TYPICAL SLAB-ON-GRADE DETAILS
N.T.S.



7 TYPICAL S.O.G. ABUTTING VERT. CONC.
N.T.S.



8 DIAMOND SLAB BLOCKOUT AT COLUMNS
N.T.S.



9 TYPICAL BOLLARD DETAILS
N.T.S.

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HENNESSEY PUBLIC SCHOOLS
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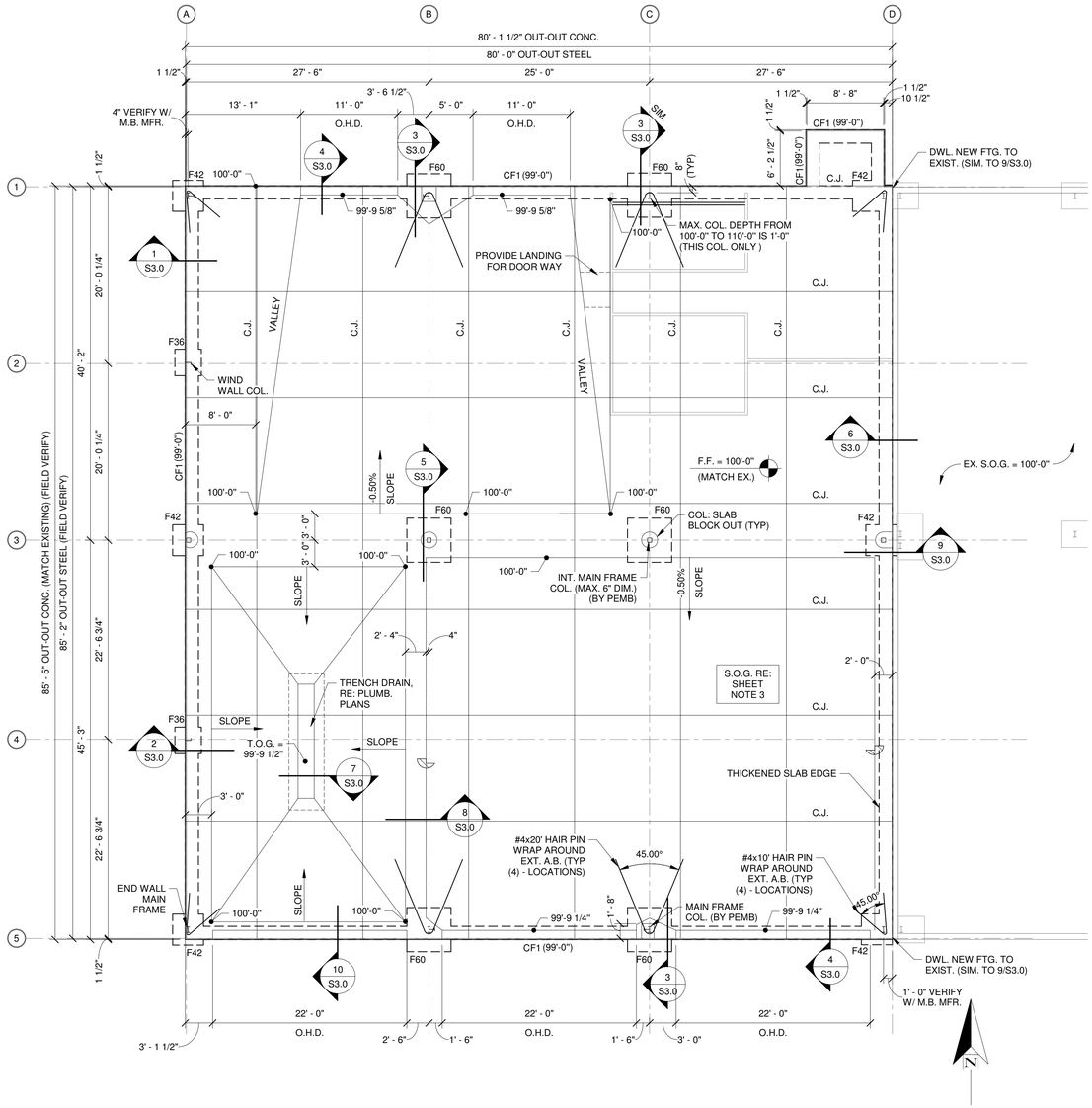
HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

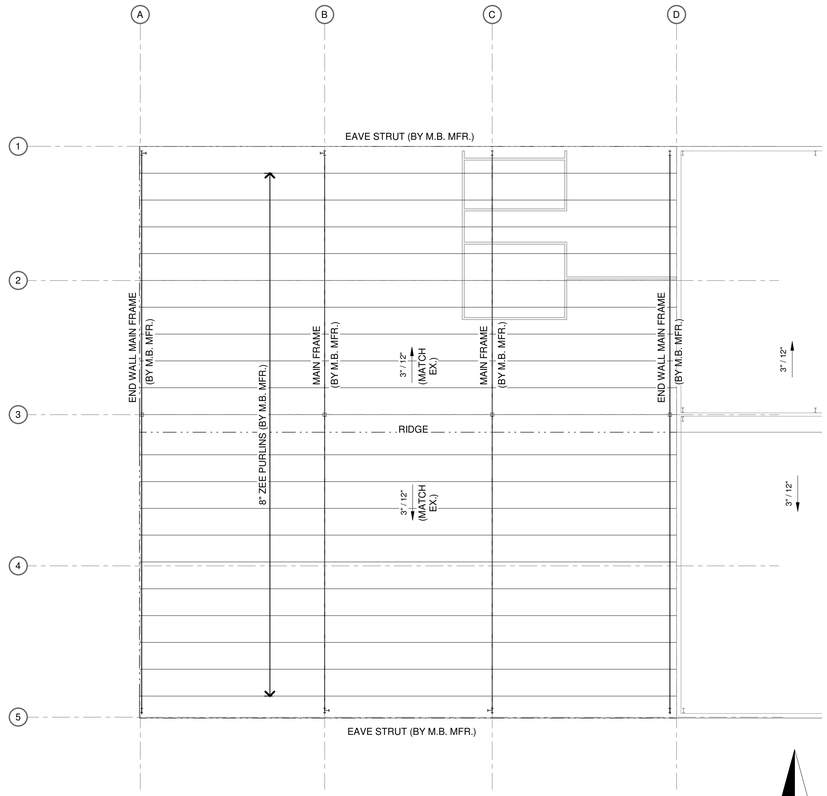
TYPICAL DETAILS

DATE: 8/10/2023

SHEET NUMBER
S1.2



1 FOUNDATION PLAN
1/8" = 1'-0"



2 ROOF FRAMING PLAN
3/32" = 1'-0"

SPREAD FOOTING SCHEDULE						
TYPE	THICKNESS	WIDTH	LENGTH	TOP MAT. REINF.	BOT. MAT. REINF.	T.O.F.
F36	2' - 0"	3' - 0"	3' - 0"	(4)-#5x2'-6" EA. WAY	(4)-#5x2'-6" EA. WAY	99' - 0"
F42	2' - 0"	3' - 6"	3' - 6"	(4)-#5x3'-0" EA. WAY	(4)-#5x3'-0" EA. WAY	99' - 0"
F60	2' - 0"	5' - 0"	5' - 0"	(6)-#5x4'-6" EA. WAY	(6)-#5x4'-6" EA. WAY	99' - 0"

CONTINUOUS FOOTING SCHEDULE					
TYPE	THICKNESS	WIDTH	LONG. REINF.	TRANSV. REINF.	CLOSED TIES
CF1	2' - 0"	1' - 6"	(2) - #5 CONT. T&B	-	#3 CLOSED TIES AT 32" O.C.

SHEET NOTES:

1. GRIDS ARE TO FACE OF STEEL GIRTS AND/OR CENTERLINE OF STEEL COLUMNS AND STEEL BEAMS.
2. DATUM FOR STRUCTURAL WORK IS TOP OF SLAB-ON-GRADE= 100'-0", REFER TO CIVIL DRAWINGS FOR TRUE ELEVATION.
3. SLAB-ON-GRADE SHALL BE 6" THICK CONCRETE WITH #4 AT 16" O.C. EACH WAY AND WATER REPELLANT ON A VAPOR BARRIER AND 6" GRANULAR BASE. SLAB SHALL BE SEALED
4. WHERE BASE PLATES FOR MAIN FRAME COLUMNS, PORTAL FRAME COLUMNS, AND COLUMNS WITH X-BRACING HAVE OVERSIZED HOLES FOR ANCHOR BOLTS, PROVIDE 5/16"x2" PLATE WASHER WITH STANDARD HOLES. ATTACH PLATE WASHER TO BASE PLATE WITH 1/4" FILLET WELDS.
5. TIE RODS AND/OR HAIRPINS PROVIDE STABILITY FOR BUILDING IN IT'S FINAL STATE, DO NOT CUT, USE CAUTION DURING SAW CUTTING OF SLAB JOINT.
6. REFER TO SHEET S1.2 FOR TYPICAL CONCRETE AND FOUNDATION DETAILS.
7. REFER TO THIS SHEET FOR FOOTING SCHEDULE.
8. REFER TO SHEET S1.2 FOR SLAB-ON-GRADE SUBGRADE REQUIREMENTS.
9. PORTAL FRAMES AND/OR X-BRACING LOCATIONS BY METAL BUILDING MANUFACTURER. VERIFY OPENINGS AND ARCHITECTURAL INTENT IS NOT OBSTRUCTED. ANY PORTAL FRAME/X-BRACE LOCATIONS SHOWN ON THIS PLAN ARE SUGGESTIONS AND MAY BE RELOCATED BY THE METAL BUILDING ENGINEER.
10. COORDINATE METAL BUILDING COMPONENT SIZE LIMITATIONS WITH ARCHITECTURAL PLANS.
11. COORDINATE METAL BUILDING EAVE HEIGHT, ROOF SLOPE WITH ARCHITECTURAL PLANS.

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HENNESSEY PUBLIC SCHOOLS CAMPUS IMPROVEMENTS

BUS BARN RENOVATION AND SITE IMPROVEMENTS

HENNESSEY, OKLAHOMA

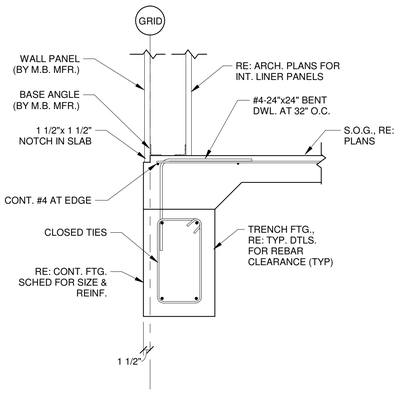
REVISIONS:
LABEL: DATE:

FOUNDATION/ ROOF RAMING PLAN

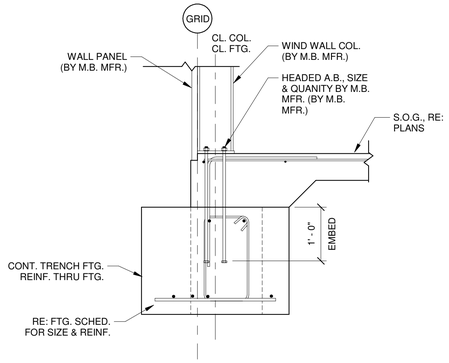
DATE: 8/10/2023

SHEET NUMBER

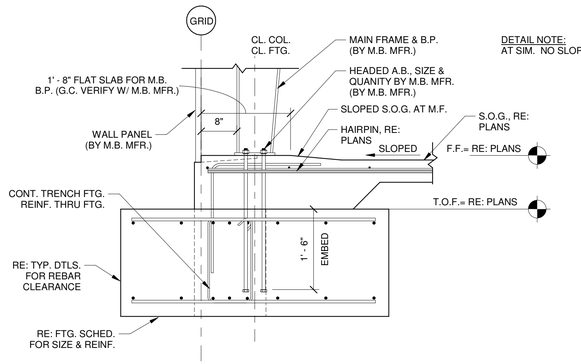
S2.0



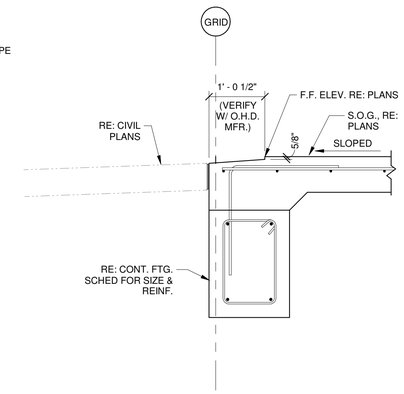
1 PERIMETER TRENCH FOOTING SECTION
3/4" = 1'-0"



2 END WALL FOOTING SECTION
3/4" = 1'-0"



3 MAIN FRAME FOOTING SECTION
3/4" = 1'-0"



4 FOUNDATION SECTION AT O.H.D.
3/4" = 1'-0"

5 INTERIOR SPREAD FOOTING SECTION
3/4" = 1'-0"

6 PERIMETER THICKENED SLAB SECTION AT EX. BLDG.
3/4" = 1'-0"

7 TRENCH DREAIN SECTION- TYPICAL
3/4" = 1'-0"

8 SLOPED S.O.G. SECTION
3/4" = 1'-0"

9 FOUNDATION SECTION AT END WALL COL
3/4" = 1'-0"

10 FOUNDATION SECTION AT WASH BAY O.H.D.
3/4" = 1'-0"

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SEAL:

HENNESSEY PUBLIC SCHOOLS CAMPUS IMPROVEMENTS

BUS BARN RENOVATION AND SITE IMPROVEMENTS

HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

DETAILS

DATE: 8/10/2023

SHEET NUMBER
S3.0

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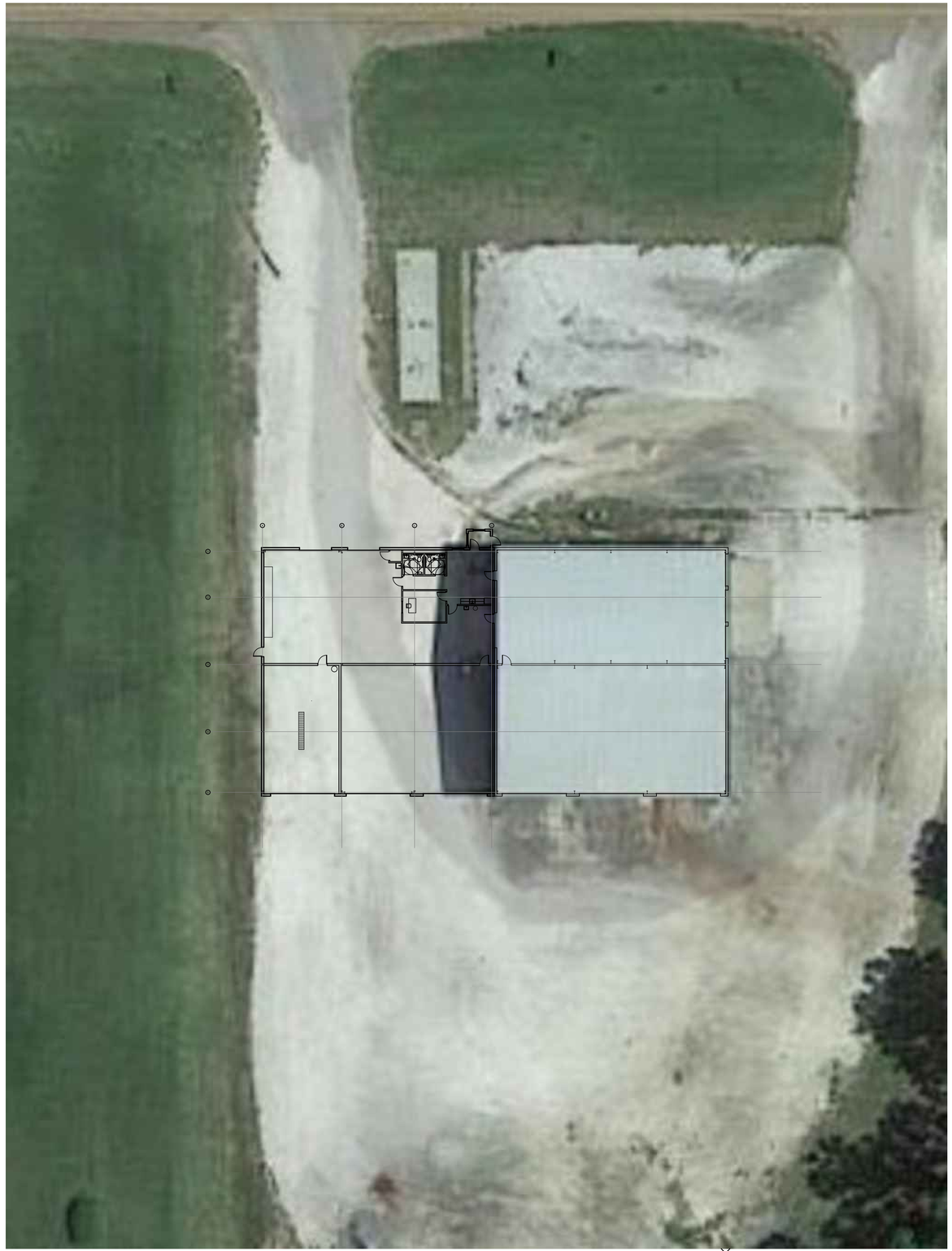

A PROPOSED SITE PLAN
SCALE: 1" = 20'-0"

13,780 S.F.

NORTH

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STATE OF OKLAHOMA
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20115
REGISTERED ARCHITECT

08/11/2023

HENNESSEY PUBLIC SCHOOLS
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BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

SHEET TITLE:
BUS BARN SITE PLANS

DATE: 08-10-2023

SHEET NUMBER
A1.101

Date: Aug 10, 2023, 11:23am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\A1.101 - Bus Barn Site Plans.dwg

DEMOLITION KEY NOTES:

1* ALL WALLS SHOWN AS DASHED TO BE REMOVED NOTIFY ARCHITECT OF ANY LOAD-BEARING CONDITIONS PRIOR TO REMOVAL.

2* EXISTING COLUMN TO REMAIN AND PROTECT.

3* REMOVE PORTION OF EXISTING WALL FOR NEW OPENING. PROVIDE STEEL LINTELS AS REQUIRED.

4* REMOVE EXISTING DOOR AND FRAME. RETAIN DOOR PANEL FOR FUTURE USE.

5* REMOVE PORTION OF EXISTING WALL FOR NEW DOOR.

6* REMOVE EXISTING TOILET PARTITIONS.

7* REMOVE MILLWORK AND TOILET FIXTURES.

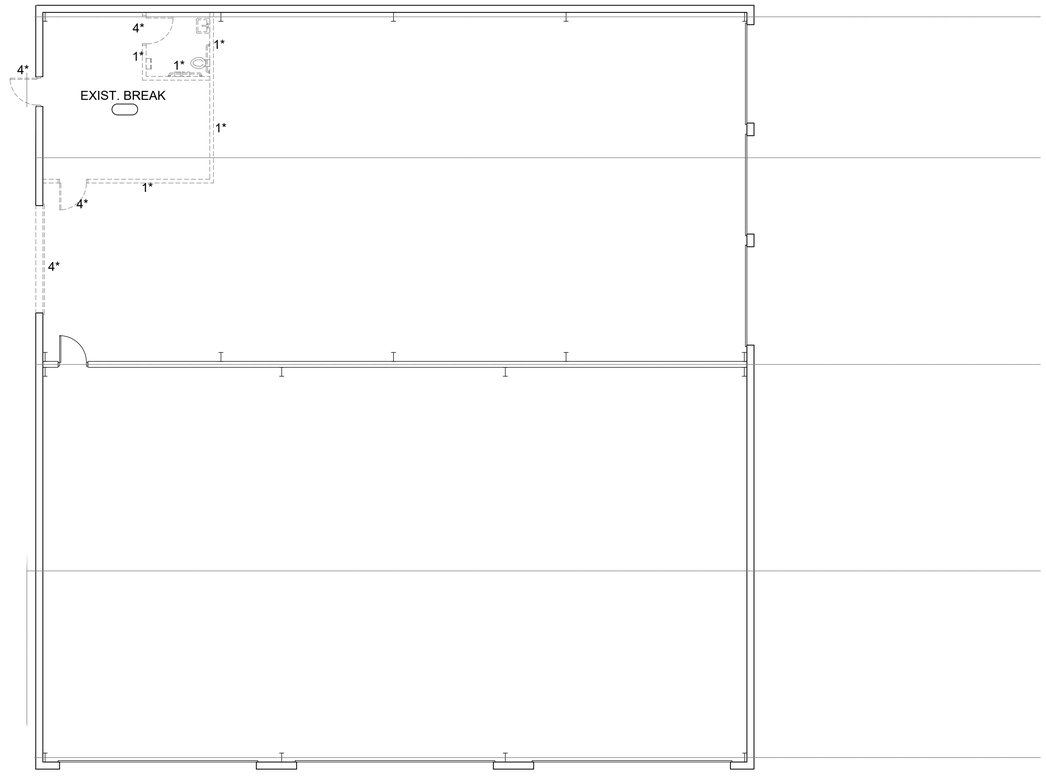
NOTE:
FIELD VERIFY ALL EXISTING CONDITIONS AS REQUIRED.

DEMOLITION GENERAL NOTES:

1. TAKE PRECAUTIONS AS TO NOT DAMAGE EXISTING WALL OR CONCRETE FOUNDATION OF EXISTING BUILDING TO REMAIN.
2. PROTECT FROM DAMAGE ALL EXISTING PROPERTY TO REMAIN.
3. CONTRACTOR SHALL STOP WORK AND NOTIFY ARCHITECT IF ANY MATERIALS ENCOUNTERED APPEAR TO CONTAIN ASBESTOS OR ANY OTHER HAZARDOUS MATERIALS.
4. COORDINATE WORK WITH UTILITY COMPANIES. NOTIFY BEFORE STARTING WORK AND COMPLY WITH THEIR REQUIREMENTS. OBTAIN REQUIRED PERMITS.
5. PROTECT ALL EXISTING OPENINGS AND DOORWAYS THAT BECOME EXPOSED TO THE EXTERIOR AS A RESULT OF DEMOLITION ACTIVITIES.

SALVAGE RIGHTS:

ALL ITEMS TO BE DEMOLISHED SHALL BE OFFERED TO OWNER FOR FIRST SALVAGE RIGHTS. CAREFULLY REMOVE ANY ITEMS TO BE RETAINED BY OWNER AND DELIVER ITEM IN SAME CONDITION AS PRIOR TO REMOVAL. ALL ITEMS TO BE DEMOLISHED AND NOT SPECIFICALLY IDENTIFIED AND CLAIMED BY OWNER SHALL BECOME RESPONSIBILITY OF THE CONTRACTOR AND DISPOSED OF OFF SITE.



1 DEMOLITION FLOOR PLAN - EXISTING
A1.302 SCALE: 1/8" = 1'-0"

NORTH

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08/11/2023

HENNESSEY PUBLIC SCHOOLS
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BUS BARN RENOVATION AND SITE IMPROVEMENTS

HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

SHEET TITLE:
DEMOLITION FLOOR PLAN

DATE: 08-10-2023

SHEET NUMBER
A1.202

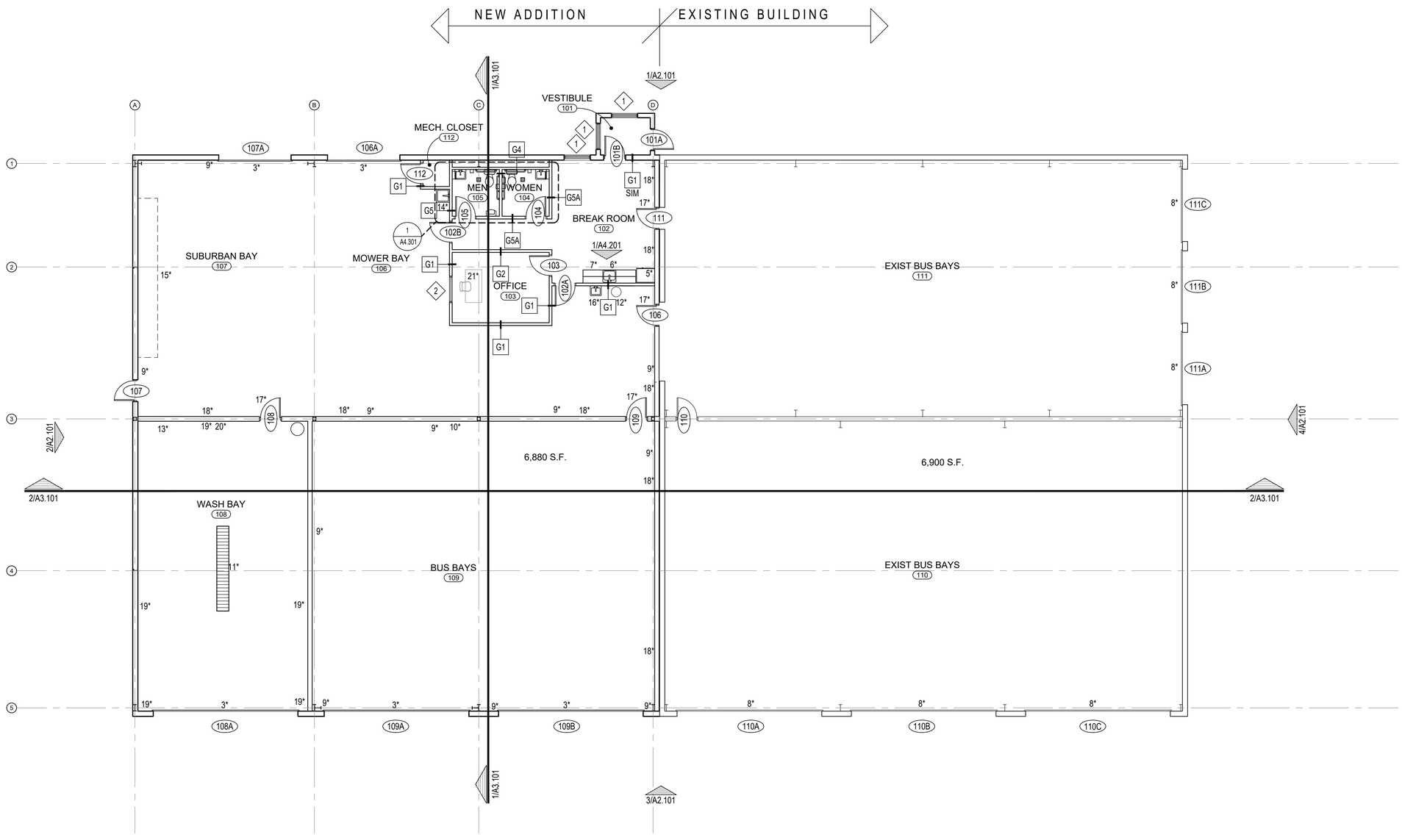
Date: Aug 10, 2023, 11:24am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\A1.202 - Demolition Floor Plan.dwg

SPECIALTY LEGEND

- FEC — FIRE EXTINGUISHER IN CABINET (TOP OF CABINET 48"AFF)
- FE — FIRE EXTINGUISHER WALL MOUNTED (TOP OF EXTINGUISHER AT 48"AFF)
- X — REFER TO A6.101 FOR WINDOW TYPES
- XXX — REFER TO A6.101 FOR DOOR TYPES
- XX — REFER TO A3.301 FOR WALL TYPES

KEYNOTES

1* NOT USED
2* NOT USED
3* NEW OVERHEAD DOOR
4* NOT USED
5* REFRIGERATOR (BY OWNER)
6* SINK
7* BASE CABINET WITH UPPER CABINETS & SHELVES
8* EXIST OVERHEAD DOOR TO REMAIN
9* MTL. LINER PNL. ON WALL ASSEMBLY TO EXTEND 8' AFF
10* LOCATE POWER & OUTLETS EACH SIDE OF WALL FOR POWER NEEDS OF MAINTENANCE & SERVICE EQUIPMENT
11* TRENCH DRAIN RE: A6.401
12* OWNER SUPPLIED DRINKING WATER DISPENSER
13* WATER SOFTENER SYSTEM
14* CUSTODIAL SINK
15* WORK AREA: OWNER PROVIDED WELDER, COMPRESSOR & WORK BENCH, (PROVIDE 220 POWER AS REQ'D.)
16* WALL MOUNTED STAINLESS STEEL HAND WASH SINK
17* NEW 90 MIN. RATED DOOR
18* NEW 2 HR RATED FIRE BARRIER UL 419
19* MTL. LINER PNL. ON WALL ASSEMBLY TO EXTEND TO UNDERSIDE OF ROOF
20* HOSE BIB FOR POWER WASHER
21* REFER TO FURNITURE BY OWNER



A FLOOR PLAN NOTATIONAL
SCALE: 1/8" = 1'-0"

NORTH

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HENNESSEY, OKLAHOMA

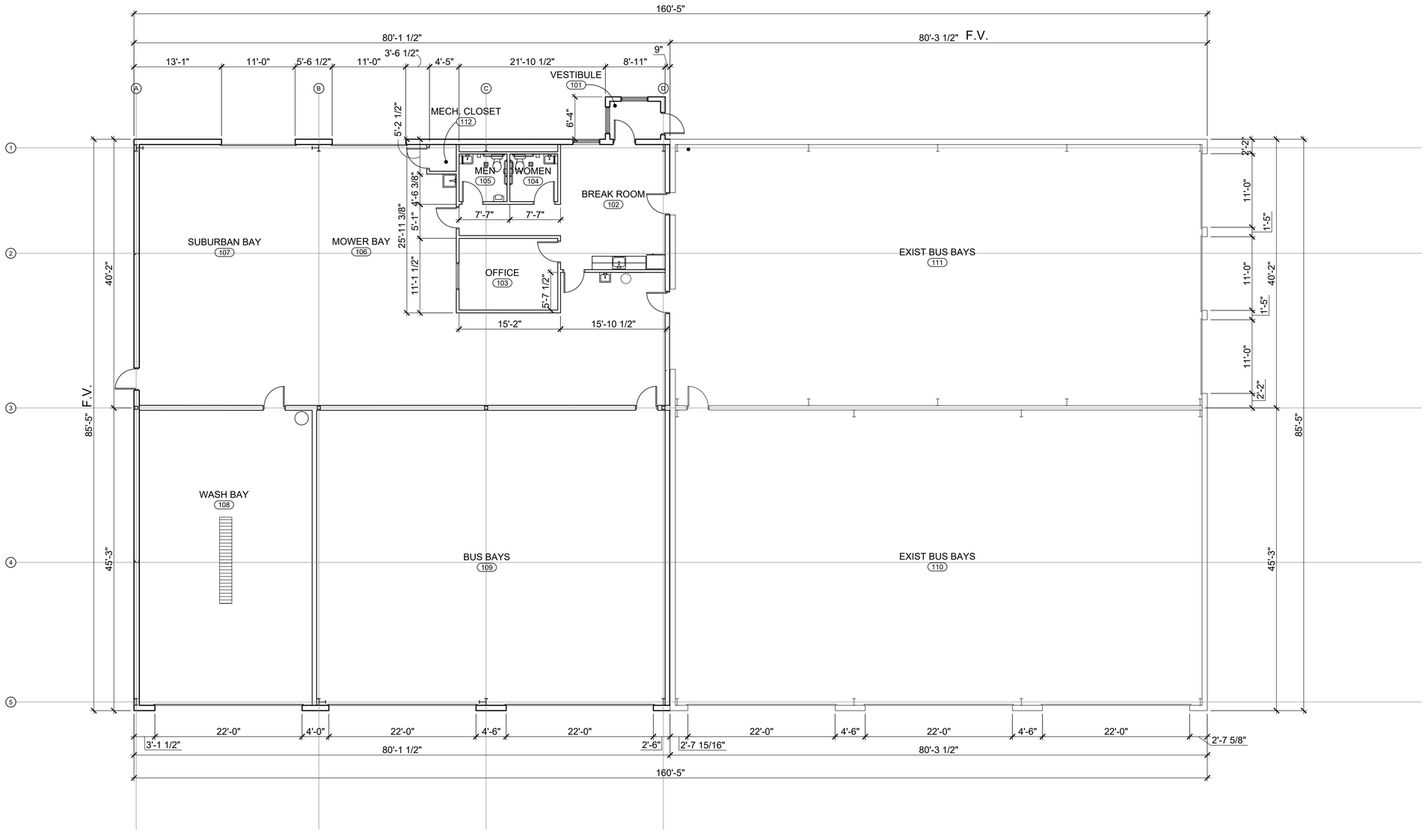
REVISIONS: MG
LABEL: DATE:

SHEET TITLE: FLOOR PLANS - NOTATIONAL

DATE: 08-10-2023

SHEET NUMBER
A1.301

Date: Aug 10, 2023, 11:24am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\A1.301 - Floor Plans - Notational.dwg



A FLOOR PLAN DIMENSIONAL
SCALE: 1/8" = 1'-0"

NORTH

Date: Aug 10, 2023, 11:24am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\A1.302 - Floor Plans - Dimensional.dwg

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LICENSED ARCHITECT

08/11/2023

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

SHEET TITLE:
FLOOR PLANS - DIMENSIONAL

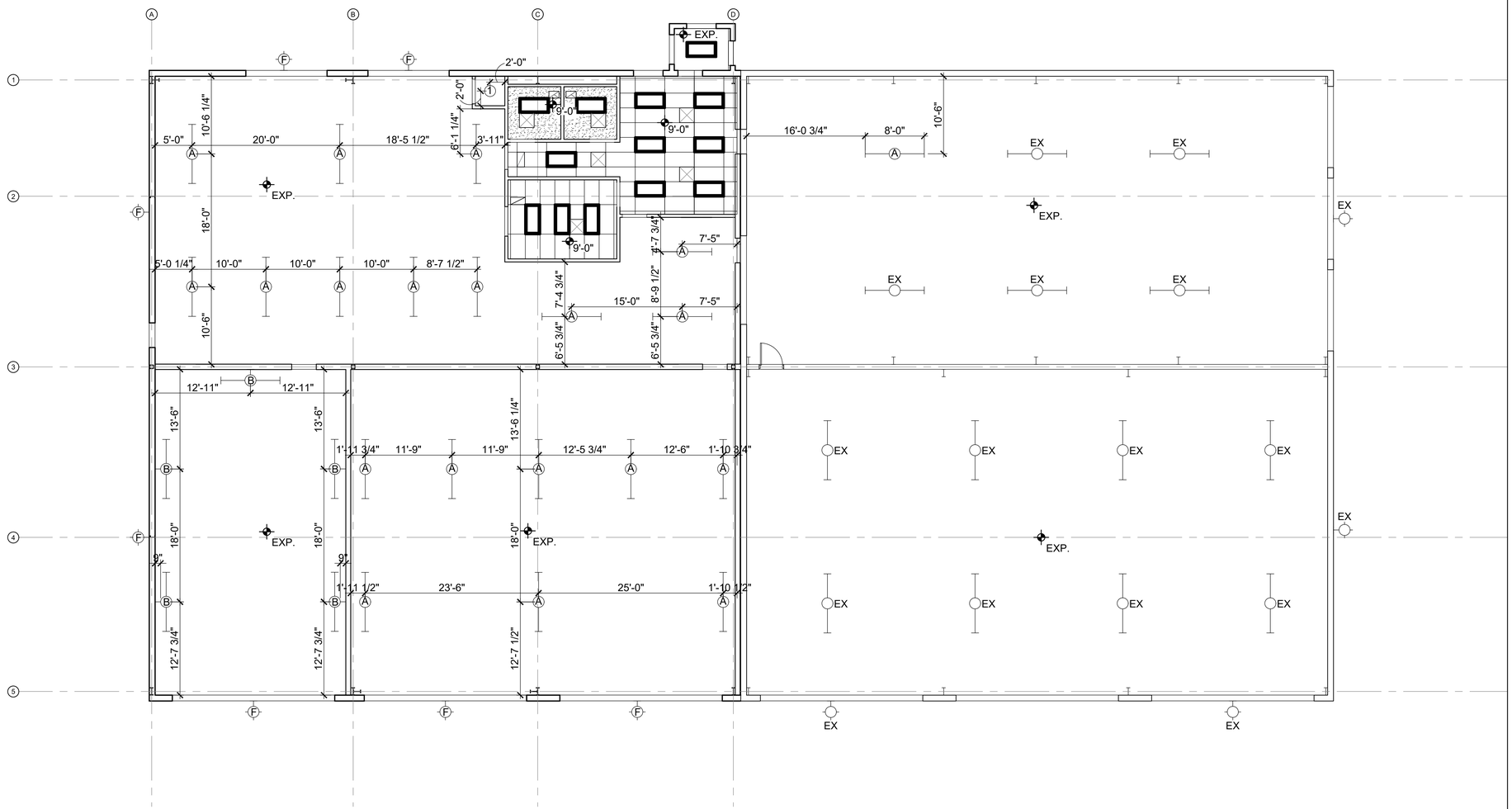
DATE: 08-10-2023

SHEET NUMBER
A1.302

LEGEND:

- 2'X4' ACOUSTICAL TILE CEILING
- 2'X2' ACOUSTICAL TILE CEILING
- SUPPLY DIFFUSER
- RETURN DIFFUSER
- EXHAUST FAN
- LINEAR SUPPLY AIR DIFFUSER
- GYPSUM BOARD
- MS1 & MS2 METAL SOFFIT PANEL
- 2'X4' LED LIGHT FIXTURE
- RECESSED FLUSH MOUNTED LED DOWN LIGHT
- FLAT FACE SURFACE MOUNTED LED LIGHT
- PENDANT MOUNTED LED STRIP LIGHT
- RECESSED T-BAR LED LIGHT
- SURFACE MOUNTED LINEAR LED LIGHT
- LED LIGHT TAPE MOUNTED WITHIN COVE
- PENDANT MOUNTED LED LIGHT

NOTES:
1. ALL CEILING HEIGHTS ARE AS IDENTIFIED EXCEPT FOR EXPOSED STRUCTURE. ALL CEILINGS ARE EXPOSED STRUCTURE UNLESS NOTED OR SHOWN OTHERWISE.
2. ALL CEILING GRIDS TO BE CENTERED IN ROOMS U.N.O.
3. VERIFY AND COORDINATE ALL LIGHTING FIXTURES, DIFFUSERS, ETC. WITH MECHANICAL / ELECTRICAL
4. NOT USED
5. NOT USED.
6. NOT ALL LIGHT FIXTURES ON LEGEND ARE USED. REFER TO ELECTRICAL FOR SPECIFIC TYPES



1 REFLECTED CEILING PLAN
A1.501 SCALE: 1/8" = 1'-0"

NORTH

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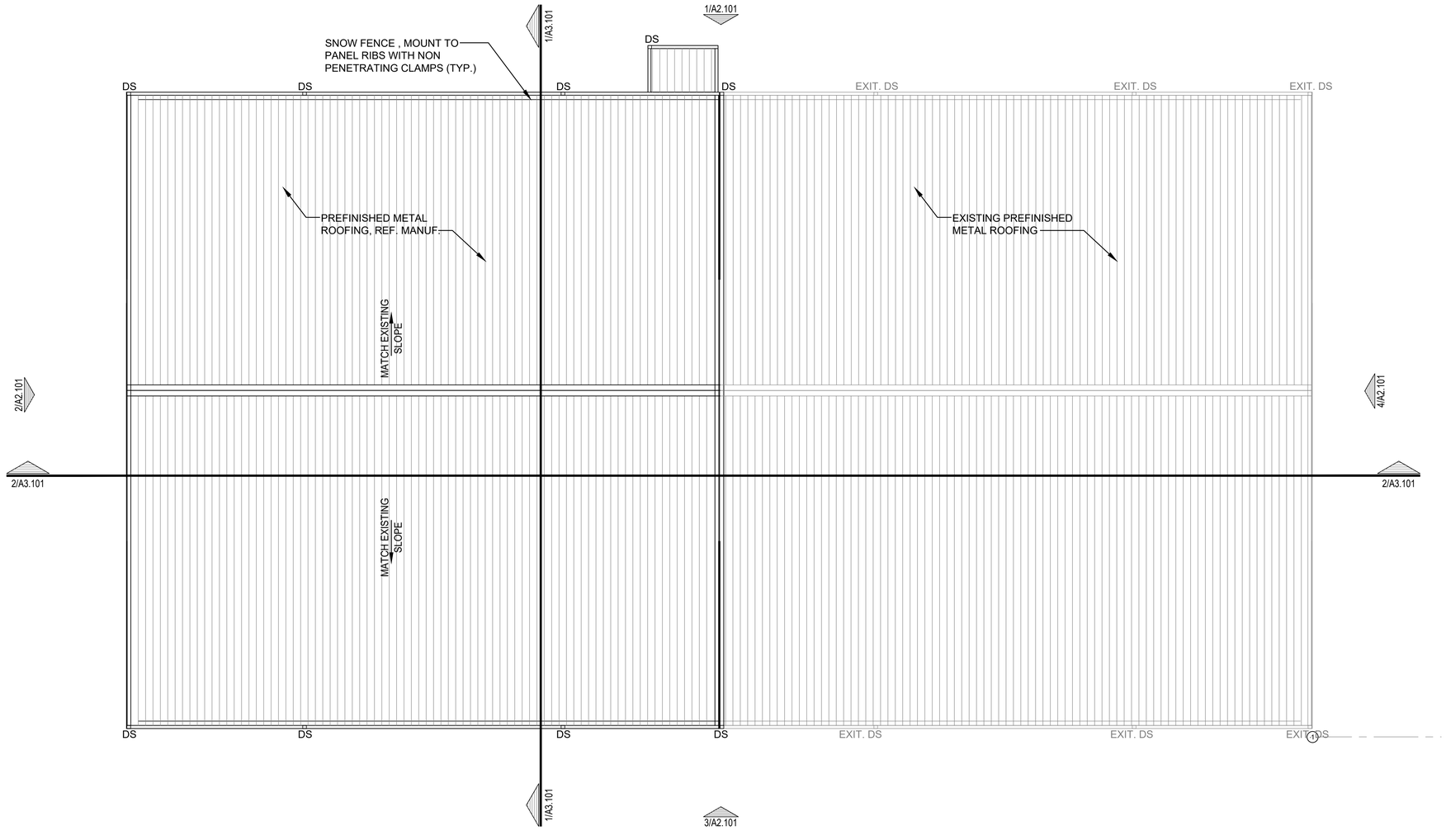
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

SHEET TITLE:
REFLECTED CEILING PLAN

DATE: 08-10-2023

SHEET NUMBER
A1.501



1 ROOF PLAN
A1.601 SCALE: 1/8" = 1'-0"

NORTH

Date: Aug 10, 2023, 11:24am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\A1.601 - Roof Plan.dwg

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HENNESSEY, OKLAHOMA

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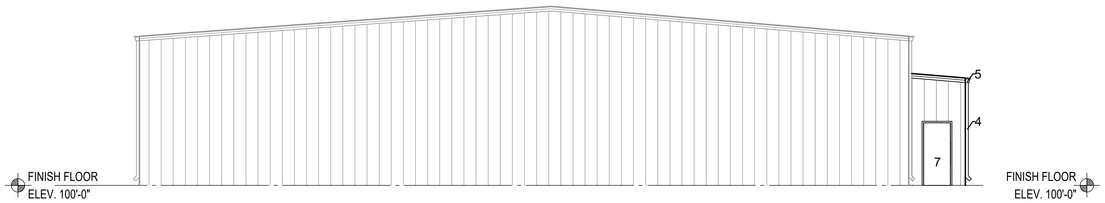
LABEL: DATE:

SHEET TITLE:
ROOF PLAN

DATE: 08-10-2023

SHEET NUMBER
A1.601



4 EAST ELEVATION
A2.101 SCALE: 1/8" = 1'-0"

EXTERIOR COLOR LEGEND

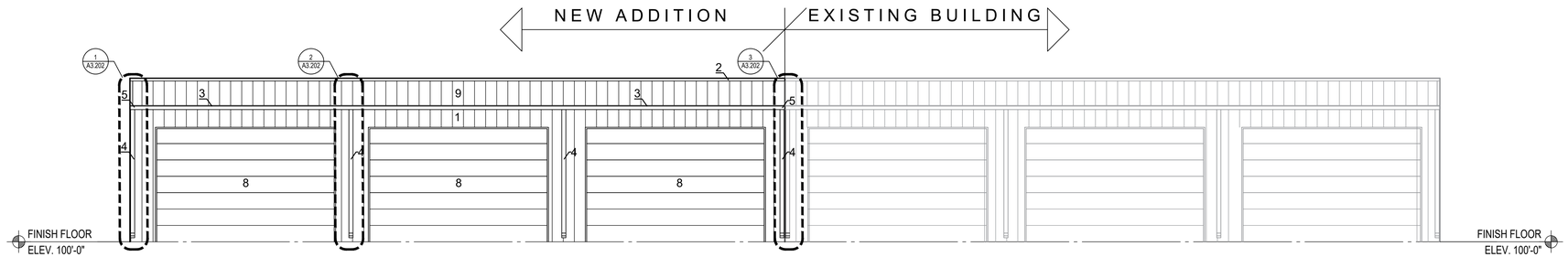
METAL PANELS
MWP1 - PBR PANEL TO MATCH COLOR OF EXISTING MTL. BLDG. "GREY" WALL PANEL
MWP2 - PNR-PANEL TO MATCH COLOR OF EXISTING MTL. BLDG ROOF PANEL "WHITE"

TRIM / FLASHING & DOWNSPOUT
MT1 - PREFINISH MTL. TRIM TO MATCH EXISTING MTL. BLDG. "BLUE" AT EAVE, RAKE, OUTSIDE WALL CORNER, WINDOW, DOOR & OVERHEAD DOOR LOCATIONS

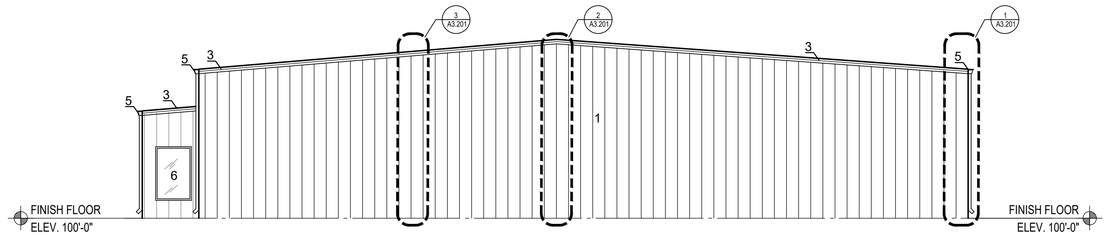
DOOR & FRAMES
EXTERIOR = HOLLOW METAL PER PEMB MANUFACTURER -FINISH TO MATCH MWP1

KEY NOTES

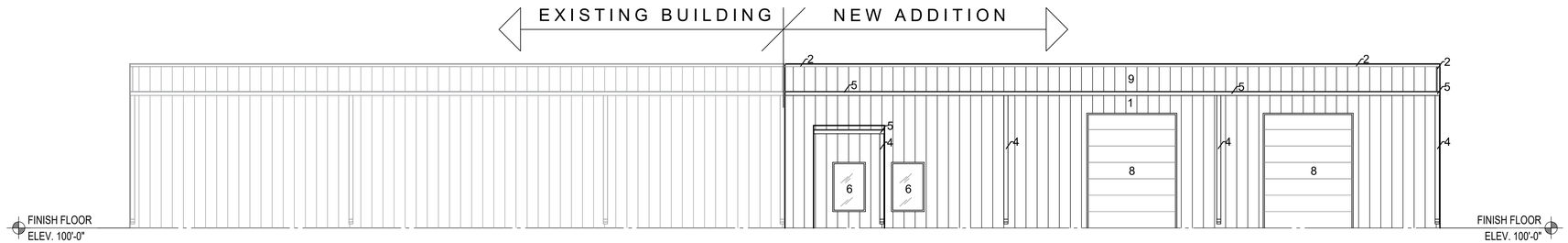
1. PREFABRICATED METAL PANEL - MWP1
2. PREFINISHED METAL CAP - MT1
3. PREFINISHED METAL TRIM - MT1
4. PREFINISHED METAL DOWNSPOUT
5. GUTTERS - MWP2
6. ALUMINUM WINDOW
7. HOLLOW METAL DOOR AND FRAME
8. OVERHEAD SECTIONAL DOORS TO MATCH EXISTING
9. PREFINISHED METAL ROOF - MWP2



3 SOUTH ELEVATION
A2.101 SCALE: 1/8" = 1'-0"



2 WEST ELEVATION
A2.101 SCALE: 1/8" = 1'-0"



1 NORTH ELEVATION
A2.101 SCALE: 1/8" = 1'-0"

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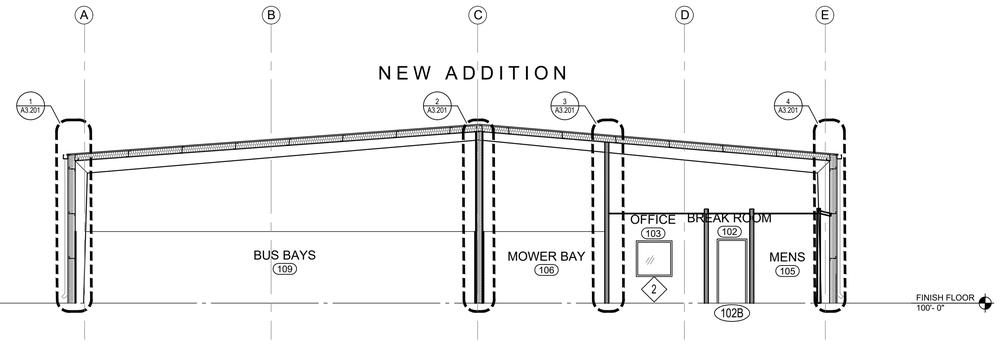
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

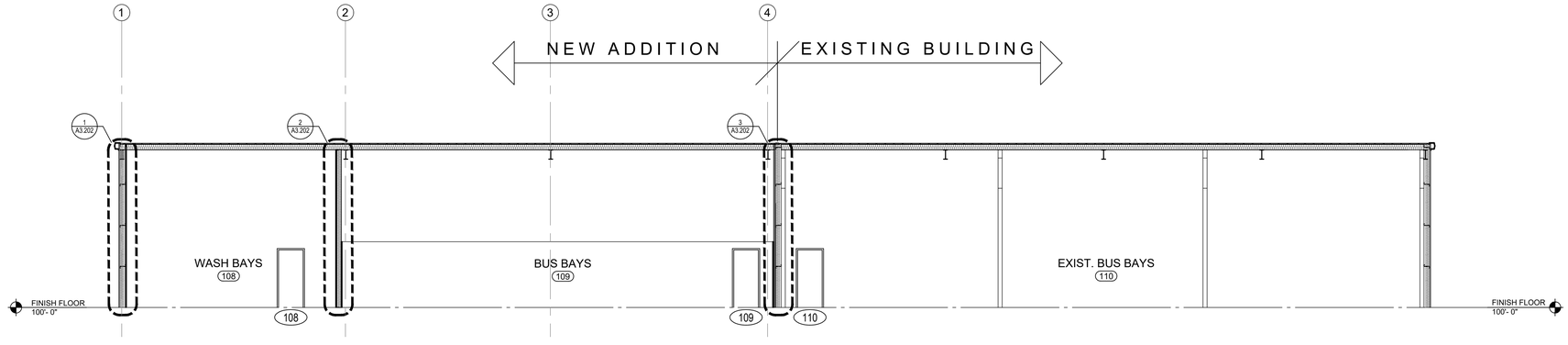
SHEET TITLE:
OVERALL EXTERIOR ELEVATIONS
DATE: 08-10-2023

SHEET NUMBER
A2.101



1 BUILDING SECTION

A3.101 SCALE: 1/8" = 1'-0"



2 BUILDING SECTION

A3.101 SCALE: 1/8" = 1'-0"

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HENNESSEY, OKLAHOMA

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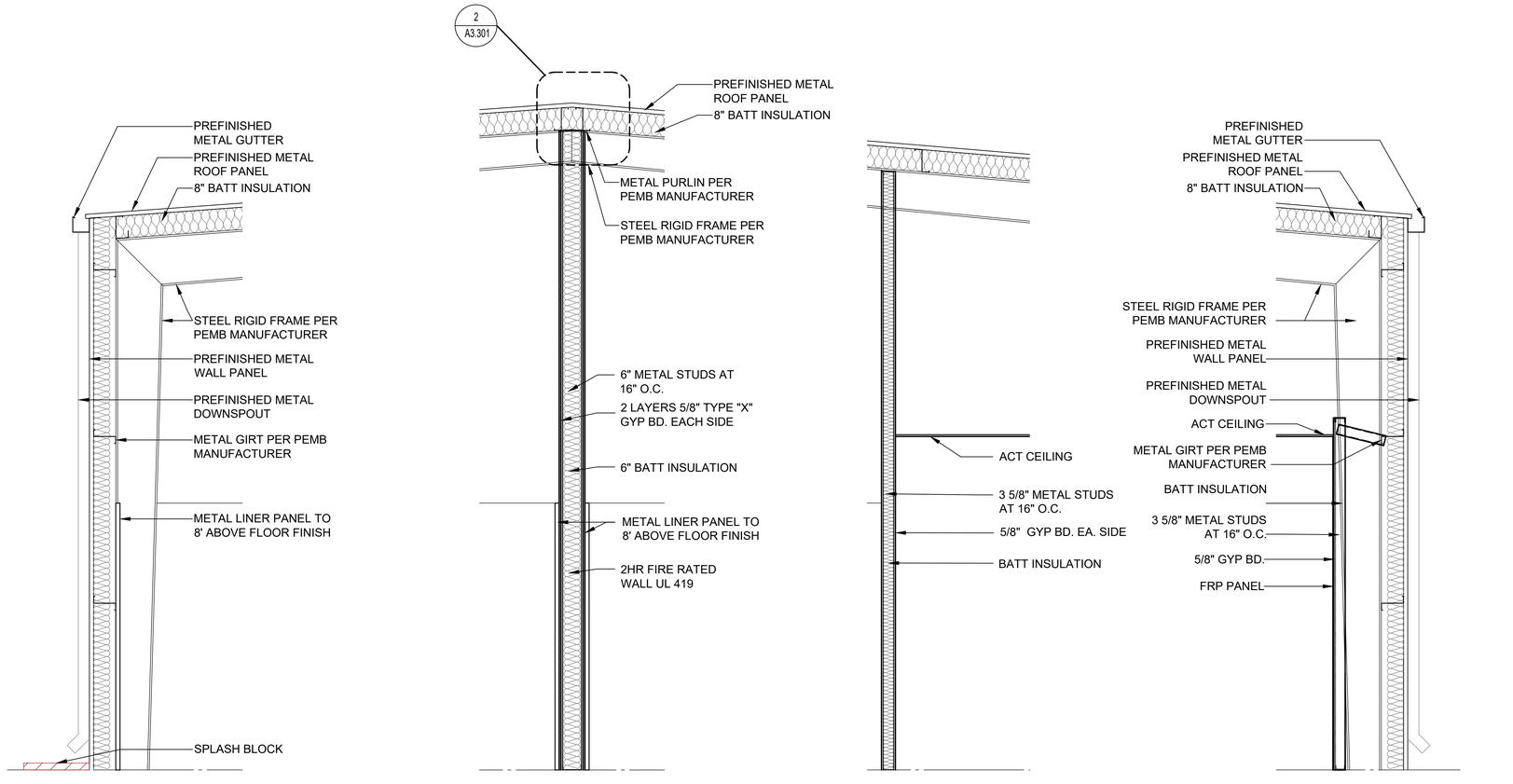
SHEET TITLE:
BUILDING SECTIONS
DATE: 08-10-2023

SHEET NUMBER
A3.101



1 WALL SECTION
A3.201 SCALE: 1/2" = 1'-0"

2 WALL SECTION
A3.201 SCALE: 1/2" = 1'-0"

3 WALL SECTION
A3.201 SCALE: 1/2" = 1'-0"

4 WALL SECTION
A3.201 SCALE: 1/2" = 1'-0"

Date: Aug 10, 2023, 11:24am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\A3.201 - Wall Sections.dwg

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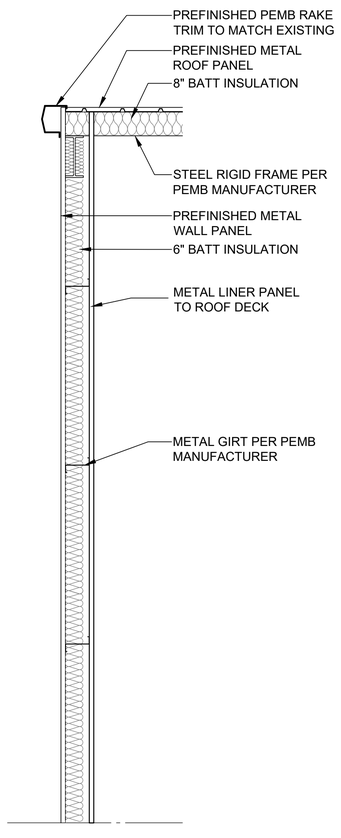
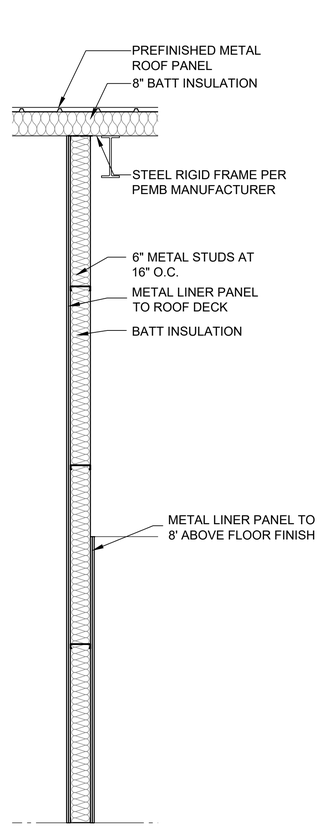
SHEET TITLE:
WALL SECTIONS
DATE: 08-10-2023

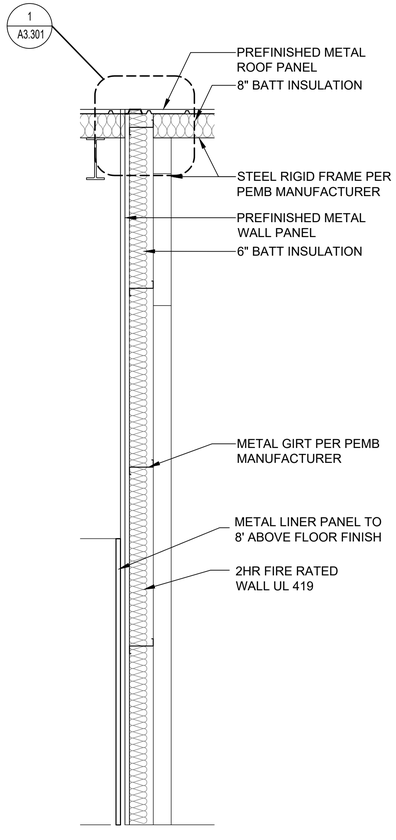
SHEET NUMBER
A3.201



1 WALL SECTION
A3.202 SCALE: 1/2" = 1'-0"



2 WALL SECTION
A3.202 SCALE: 1/2" = 1'-0"



3 WALL SECTION
A3.202 SCALE: 1/2" = 1'-0"

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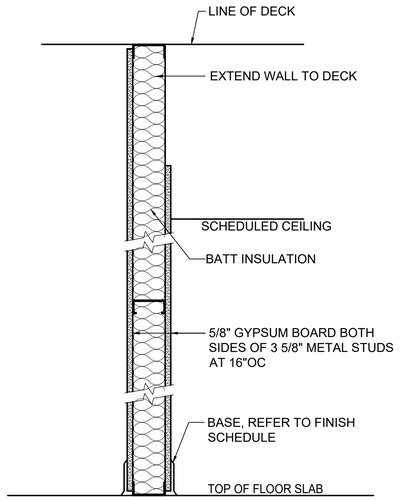
SHEET TITLE:
WALL SECTIONS
DATE: 08-10-2023

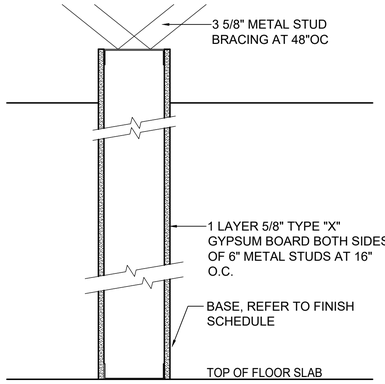
SHEET NUMBER
A3.202



PARTITION TYPE

G1

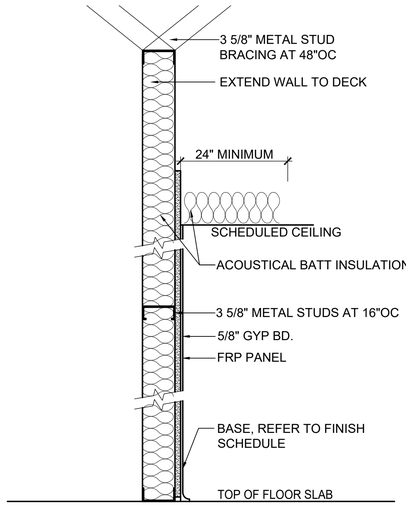
GYPSUM BOARD PARTITION



PARTITION TYPE

G2

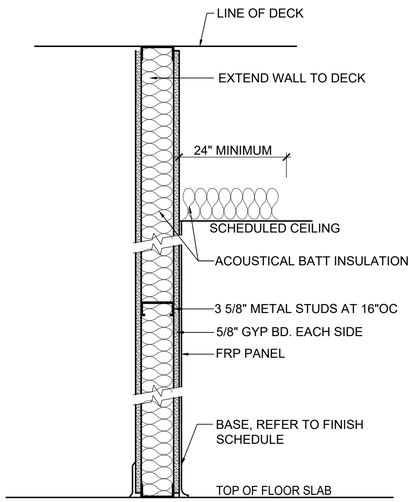
FIRE RATED GYPSUM BOARD PARTITION



PARTITION TYPE

G4

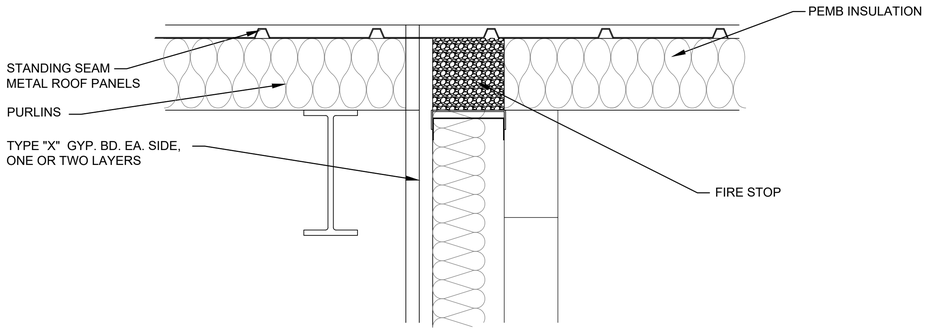
FRP WALL PARTITION



PARTITION TYPE

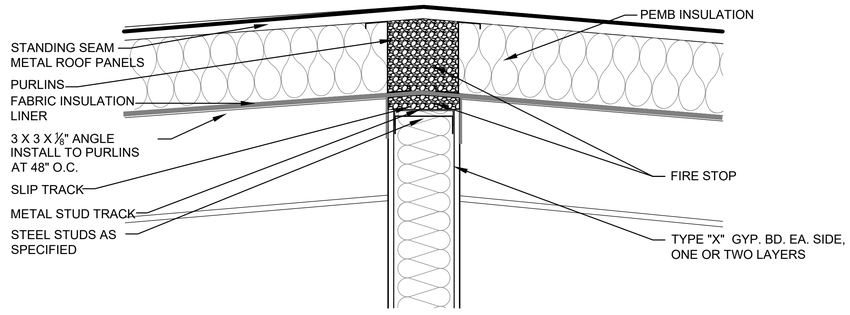
G5

FRP WALL PARTITION



1 RATED WALL TERMINATION AT UNDERSIDE OF DECK

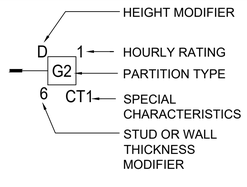
A3.301 SCALE: 1" = 1'-0"



2 RATED WALL TERMINATION AT UNDERSIDE OF DECK

A3.301 SCALE: 1" = 1'-0"

WALL TYPE TAG LEGEND



A = ACCOUSTICAL TREATMENT
CT1 = CERAMIC TILE APPLICATION (ONE SIDE ONLY)
CT2 = CERAMIC TILE APPLICATION (BOTH SIDES)
D = EXTEND PARTITION MATERIALS TO DECK & SEAL TIGHT

GENERAL NOTES:

A. ALL INTERIOR GYPSUM BOARD, LESS WHERE CEMENTITIOUS BOARD IS SCHEDULED, SHALL BE HIGH IMPACT TO 8' AFF, NON-RATED OR RATED ACCORDINGLY.

B. OTHER THAN WHERE CEMENTITIOUS BACKER BOARD IS SHOWN - INSTALL 5/8" MOISTURE RESISTANT GYPSUM BOARD WITH FIBERGLASS MATS EACH FACE ON ROOM SIDE OF WALL WHERE WALL ENCLOSES RESTROOM, CUSTODIAN, TRAINING, CONCESSION, LAUNDRY AND OTHER AREAS SUBJECT TO MOISTURE

C. TYPICAL INTERIOR METAL STUDS TO BE 25 GA. AT 16"OC, UNLESS NOTED OTHERWISE

D. INSTALL 2" LEG SLIP TRACK AT ALL LOCATIONS WHERE STUDS EXTEND TO DECK

E. SEE FINISH SCHEDULE AND FINISH PLANS FOR FINISH TYPES, INCLUDING CERAMIC TILE TYPES.

G. NO PAINT IS REQUIRED AT ALL GYPSUM BOARD INSTALLED ABOVE THEIR RESPECTIVE ADJACENT CEILINGS.

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SHEET TITLE:
WALL TYPES
DATE: 08-10-2023

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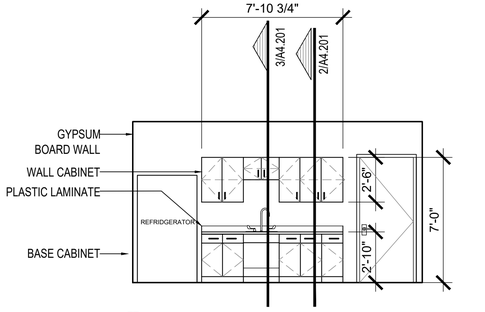
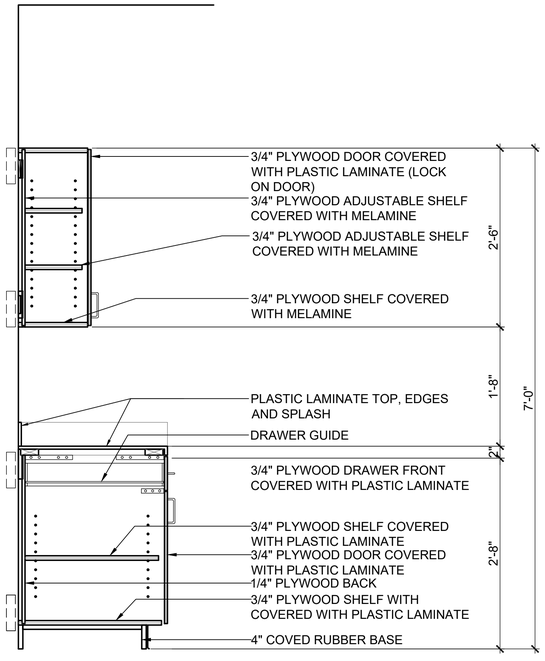
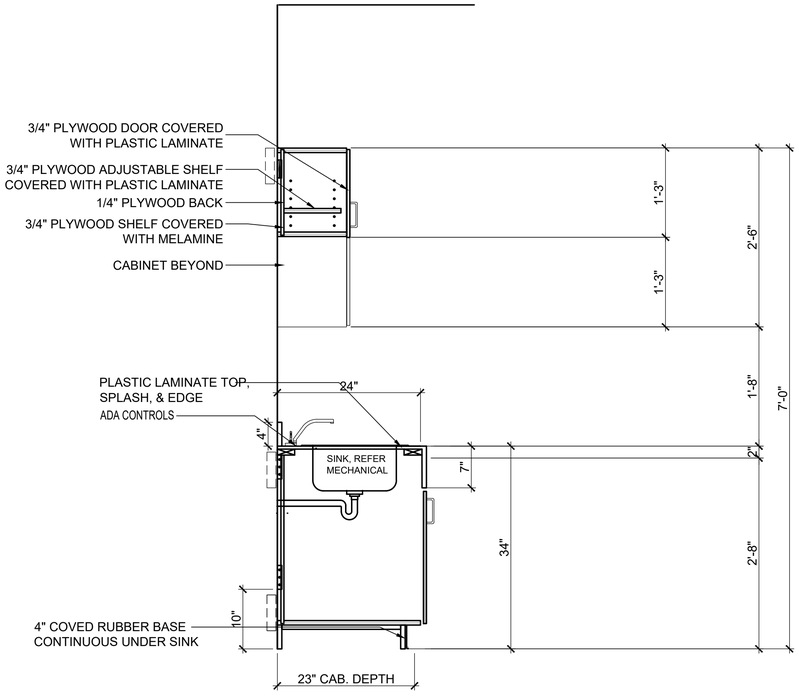


1 INTERIOR ELEVATION
A4.201 SCALE: 1/4" = 1'-0"



2 MILLWORK SECTION
A4.201 SCALE: 1" = 1'-0"



3 MILLWORK SECTION
A4.201 SCALE: 1" = 1'-0"

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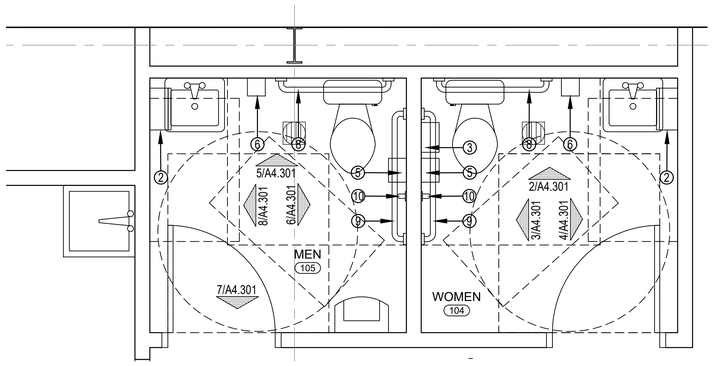
SHEET TITLE:
INTERIOR ELEVATIONS AND MILLWORK SECTIONS
DATE: 08-10-2023

SHEET NUMBER
A4.201



1 ENLARGED TOILET PLAN
A4.301 SCALE: 1/4" = 1'-0"

GENERAL NOTES

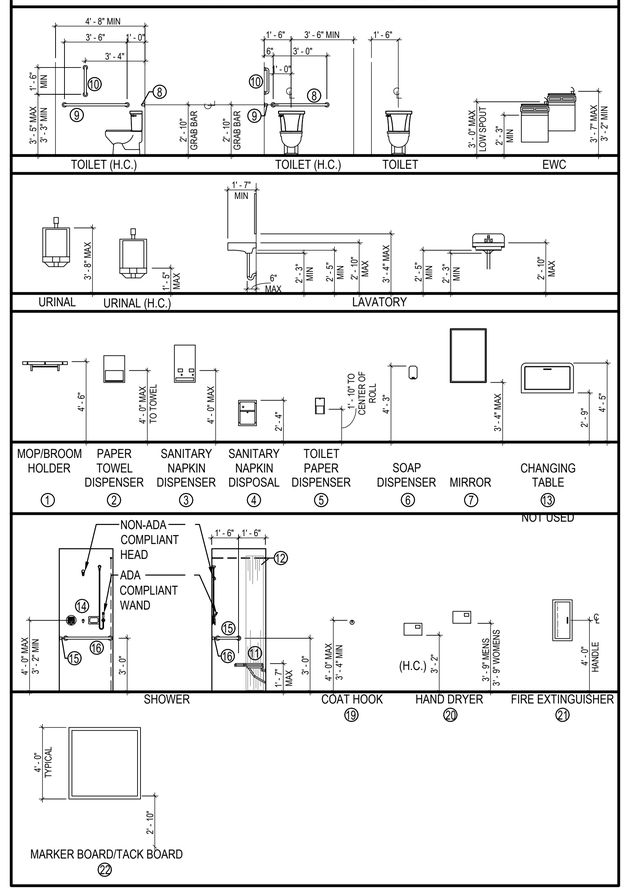
1. FLUSH CONTROL VALVES SHALL BE MOUNTED ON THE OPEN SIDE OF THE TOILET AREA NO MORE THAN 36"ABOVE THE FLOOR.
2. REFER TO COLOR LEGEND ON FINISH SCHEDULE.
3. ALL ACCESSIBLE FIXTURES AND ACCESSORIES SHALL COMPLY WITH ANSI A117.1 FOR ADDITIONAL INFORMATION.
4. PROVIDE INSULATION AT ALL EXPOSED HOT WATER AND DRAIN PIPES PER ADA/ADAAG 4.24.6

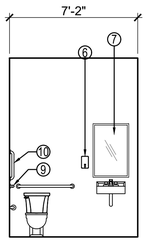
TOILET ACCESSORY LEGEND

1. MOP/BROOM HOLDER
2. PAPER TOWEL DISPENSER BY OWNER
3. SANITARY NAPKIN DISPENSER BY OWNER
4. SANITARY NAPKIN DISPOSAL
5. TOILET PAPER DISPENSER BY OWNER
6. SOAP DISPENSER BY OWNER
7. 24"X36" MIRROR
8. HORIZONTAL GRAB BAR - 36"
9. HORIZONTAL GRAB BAR - 42"
10. VERTICAL GRAB BAR - 18"
11. SHOWER SEAT
12. SHOWER ROD AND CURTAIN
13. CHANGING TABLE
14. SOAP DISH
15. HORIZONTAL GRAB BAR - 14"
16. HORIZONTAL GRAB BAR - 30"
17. CLOTHES ROD
18. COAT HOOK
19. HAND DRYER

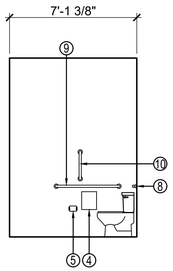
NOTES:
1. PLUMBING FIXTURES - RE: PLUMBING

MOUNTING HEIGHT SCHEDULE

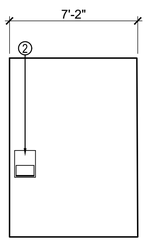




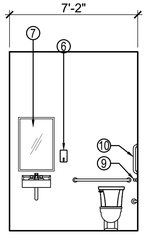
2 INTERIOR TOILET ELEVATION
A4.301 SCALE: 1/4" = 1'-0" 104



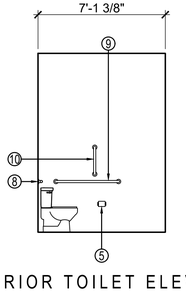
3 INTERIOR TOILET ELEVATION
A4.301 SCALE: 1/4" = 1'-0" 104



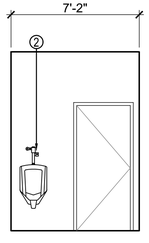
4 INTERIOR TOILET ELEVATION
A4.301 SCALE: 1/4" = 1'-0" 104



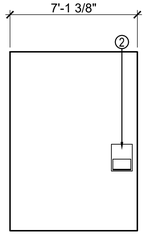
5 INTERIOR TOILET ELEVATION
A4.301 SCALE: 1/4" = 1'-0" 105



6 INTERIOR TOILET ELEVATION
A4.301 SCALE: 1/4" = 1'-0" 105



7 INTERIOR TOILET ELEVATION
A4.301 SCALE: 1/4" = 1'-0" 105



8 INTERIOR TOILET ELEVATION
A4.301 SCALE: 1/4" = 1'-0" 105

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08/11/2023

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
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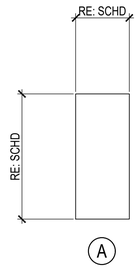
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

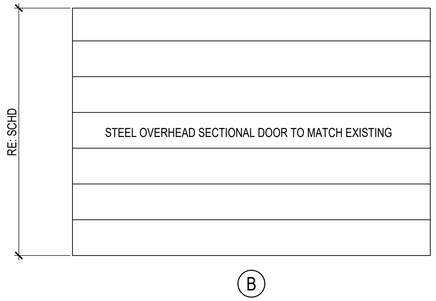
SHEET TITLE:
ENLARGED TOILET PLANS AND ELEVATIONS
DATE: 08-10-2023

SHEET NUMBER
A4.301

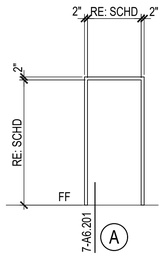
Date: Aug 10, 2023, 11:25am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\A4.301 - Enlarged Toilet Plans.dwg



1 DOOR TYPES
A6.102 SCALE: 1/4" = 1'-0"



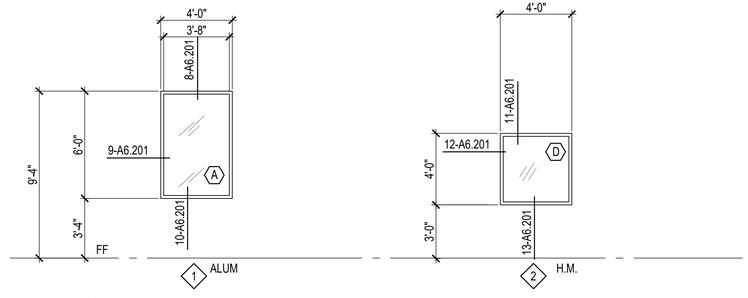
2 DOOR TYPES
A6.102 SCALE: 1/4" = 1'-0"



2 DOOR FRAME TYPES
A6.102 SCALE: 1/4" = 1'-0"

DOOR AND FRAME SCHEDULE

NO.	DOOR			FRAME		DETAILS				REMARKS	NO.
	SIZE	TYPE	MATERIAL	TYPE	MATERIAL	HEAD	JAMB	THRESHOLD	RATING		
101A	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	2-A6.201	5-A6.201	7-A6.201	---	---	101A
101B	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	1-A6.201	4--A6.201	---	---	---	101B
102A	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	1-A6.201	4-A6.201	---	---	---	102A
102B	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	1-A6.201	4-A6.201	---	---	---	102B
103	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	1-A6.201	4-A6.201	---	---	---	103
104	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	1-A6.201	4-A6.201	---	---	---	104
105	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	1-A6.201	4-A6.201	---	---	---	105
106	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	3-A6.201	6-A6.201	16-A6.201	---	90 MINUTE FIRE RATED	106
106A	11'-0" x 14'-0"	B	--	-	HM	----	----	---	---	---	106A
107	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	14-A6.201	15-A6.201	7-A6.201	---	---	107
107A	11'-0" x 14'-0"	B	--	-	HM	----	----	---	---	---	107A
108	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	3-A6.201	6-A6.201	16-A6.201	---	90 MINUTE FIRE RATED	108
108A	20'-0" x 14'-0"	B	--	-	HM	----	----	---	---	---	108A
109	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	3-A6.201	6-A6.201	16-A6.201	---	90 MINUTE FIRE RATED	109
109A	20'-0" x 14'-0"	B	--	-	HM	----	----	---	---	---	109A
109B	20'-0" x 14'-0"	B	--	-	HM	----	----	---	---	---	109B
110	EXISTING DOOR, DOOR FRAME, AND HARDWARE TO REMAIN				----	----	----	---	---	---	110
110A	EXISTING DOOR, DOOR FRAME, AND HARDWARE TO REMAIN				----	----	----	---	---	---	110A
110B	EXISTING DOOR, DOOR FRAME, AND HARDWARE TO REMAIN				----	----	----	---	---	---	110B
110C	EXISTING DOOR, DOOR FRAME, AND HARDWARE TO REMAIN				----	----	----	---	---	---	110C
111	3'-0" x 7'-0" x 1 3/4"	A	HM	A	HM	3-A6.201	6-A6.201	16-A6.201	---	90 MINUTE FIRE RATED	111
111A	EXISTING DOOR, DOOR FRAME, AND HARDWARE TO REMAIN				----	----	----	---	---	---	111A
111B	EXISTING DOOR, DOOR FRAME, AND HARDWARE TO REMAIN				----	----	----	---	---	---	111B
111C	EXISTING DOOR, DOOR FRAME, AND HARDWARE TO REMAIN				----	----	----	---	---	---	111C
112	3'-0" x 7'-0" x 1 3/4"	A	SC	-	HM	1-A6.201	4-A6.201	---	---	---	112



4 WINDOW FRAMES
A6.102 SCALE: 1/4" = 1'-0"

GLAZING SCHEDULE:

- (A) 1" INSULATING TEMPERED SAFETY LOW 'E' GLAZING - TINTED EXTERIOR AND CLEAR INTERIOR
- (B) 1" INSULATING LOW 'E' GLAZING - TINTED EXTERIOR AND CLEAR INTERIOR
- (C) 1" INSULATING GLAZING - CLEAR EXTERIOR AND CLEAR INTERIOR
- (D) NOT USED
- (E) 1/4" TEMPERED SAFETY GLAZING - CLEAR
- (F) 5/8" INSULATING TEMPERED SAFETY GLAZING - TINTED EXTERIOR AND CLEAR INTERIOR
- (G) 1/4" GLAZING - CLEAR

GENERAL NOTES:

1. ALL EXTERIOR GLAZING SHALL BE LOW 'E' WITH TINTED GLAZING ON THE OUTSIDE AND CLEAR ON THE INSIDE
2. ALL INTERIOR GLAZING TO BE CLEAR
3. USE TEMPERED GLAZING WHERE BUILDING CODE REQUIRES
4. ALL GLAZING THICKNESS' SHOWN ARE THE MINIMUM - ALL GLAZING THICKNESS' TO COMPLY WITH THE CURRENT BUILDING CODE AND WIND LOAD REQUIREMENTS
5. ALL SUB-SILL BUTT JOINTS TO HAVE AN 8" WIDE CENTERED METAL BACKER PIECE SET IN SEALANT WITH SUB-SILL SET IN SEALANT
6. ALL DIMENSIONS SHOWN ARE ROUGH OPENING DIMENSIONS - GENERAL CONTRACTOR TO CONSIDER SHIMS AND SUB-FRAME SPACE REQUIRED

HOLLOW METAL FRAME NOTES:

1. ANCHORS FOR STUD PARTITIONS SHALL BE 1" Z'S WELDED TO ALL FRAMES, RATED AND NON-RATED
2. PROVIDE A MINIMUM OF (3) ANCHORS PER JAMB FOR FRAME HEIGHTS UP TO 7'-2" AND (1) ADDITIONAL ANCHOR FOR EACH ADDITIONAL 2 FEET OF HEIGHT OR FRACTION THEREOF
3. PROVIDE (2) CONTINUOUS 1 1/2"x1 1/2"x12GA ANGLES WELDED TO FRAME HEAD AT ALL DOOR OPENINGS OVER 48"
4. SEAL THE JOINT BETWEEN THE HOLLOW METAL FRAME AND GYPSUM BOARD AND/OR CMU AT PAINTED WALLS AND PARTITIONS

KEYNOTES:
*1) INSULATED DOOR
*2) REMOVABLE MULLION
*3) TORNADO RESISTANT DOOR AND FRAME
*4) WEATHER STRIP

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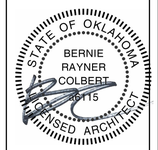


08/11/2023

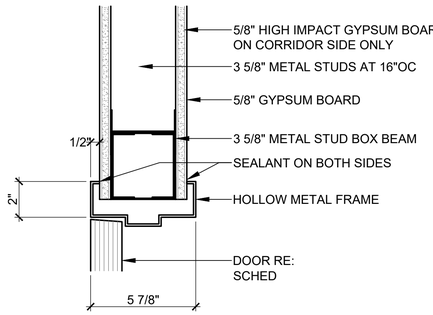
HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

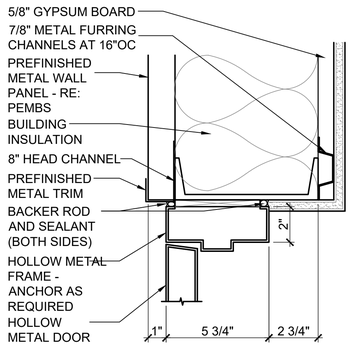
SHEET TITLE:
DOOR SCHEDULES DOOR AND FRAME TYPES

DATE: 08-10-2023

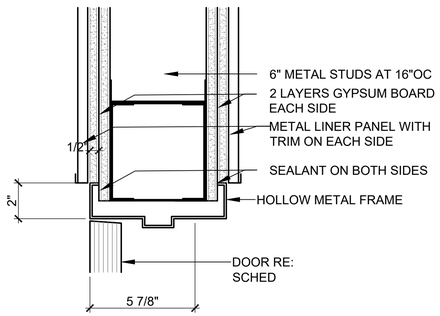
SHEET NUMBER
A6.101



1 HEAD DETAIL - DOOR
A6.201 SCALE: 3" = 1'-0"

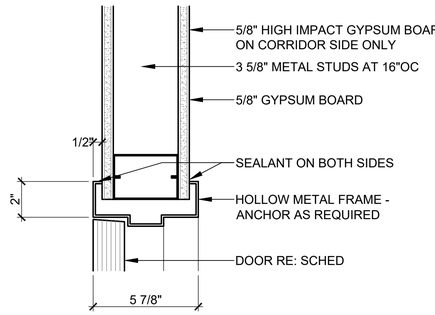


2 HEAD DETAIL - DOOR
A6.201 SCALE: 3" = 1'-0"

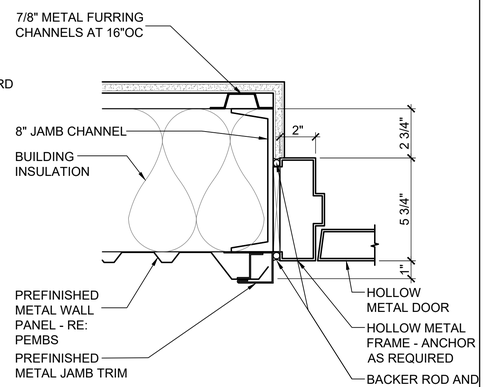


3 HEAD DETAIL - DOOR
A6.201 SCALE: 3" = 1'-0"

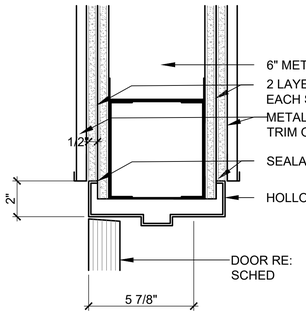
JAMB SIMILAR



4 JAMB DETAIL - DOOR
A6.201 SCALE: 3" = 1'-0"



5 JAMB DETAIL - DOOR
A6.201 SCALE: 3" = 1'-0"



6 JAMB DETAIL - DOOR
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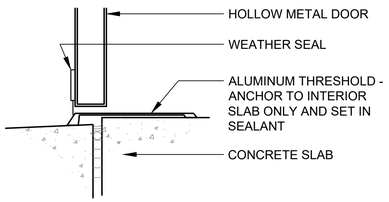

7 THRESHOLD DETAIL - DOOR
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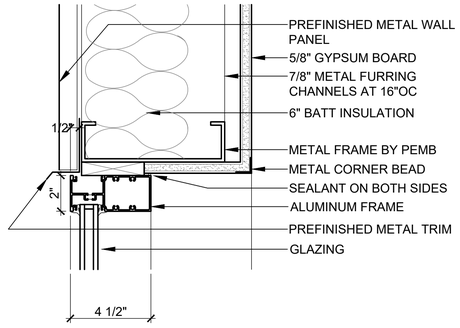
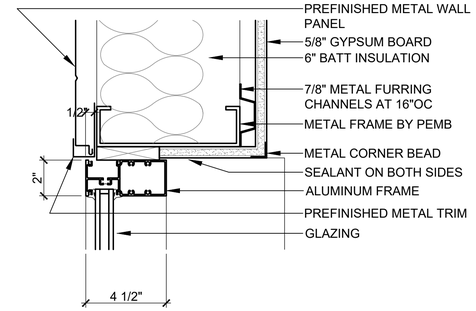
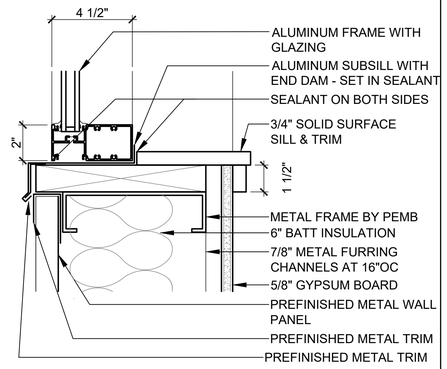


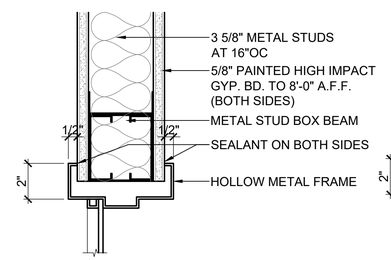
8 HEAD DETAIL - WINDOW
A6.401 SCALE: 3" = 1'-0"



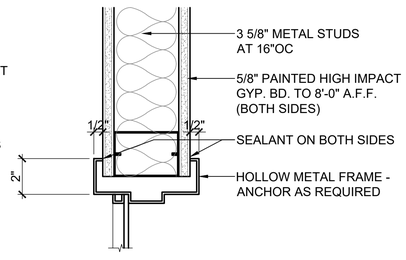
9 JAMB DETAIL - WINDOW
A6.401 SCALE: 3" = 1'-0"



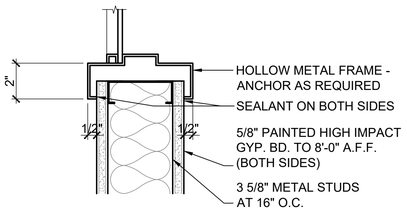
10 SILL DETAIL - WINDOW
A6.401 SCALE: 3" = 1'-0"



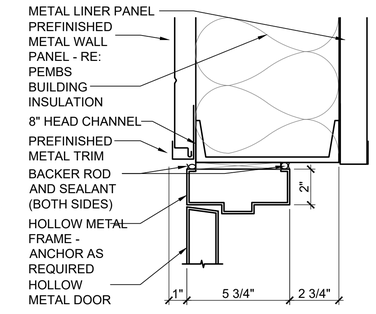
11 HEAD DETAIL - WINDOW
A6.401 SCALE: 3" = 1'-0"



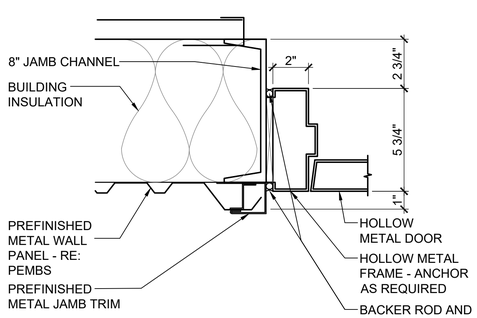
12 JAMB DETAIL - WINDOW
A6.401 SCALE: 3" = 1'-0"



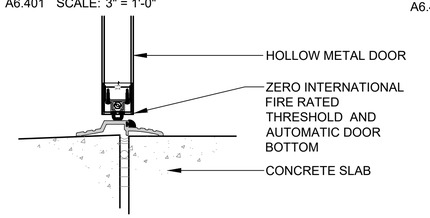
13 SILL DETAIL - WINDOW
A6.401 SCALE: 3" = 1'-0"



14 HEAD DETAIL - DOOR
A6.201 SCALE: 3" = 1'-0"



15 JAMB DETAIL - DOOR
A6.201 SCALE: 3" = 1'-0"



16 THRESHOLD DETAIL
A6.202 SCALE: 3" = 1'-0"

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HENNESSEY PUBLIC SCHOOLS
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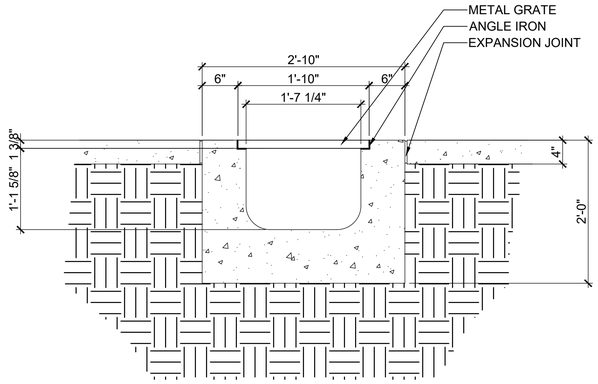

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08/11/2023

HENNESSEY PUBLIC SCHOOLS
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HENNESSEY, OKLAHOMA

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LABEL: DATE:

SHEET TITLE:
DRAIN DETAILS

DATE: 08-10-2023

SHEET NUMBER
A6.401

INTERIOR COLOR LEGEND

PAINT
P1 - SHERWIN WILLIAMS SW 7015 REPOSE GRAY - FIELD
P2 - SHERWIN WILLIAMS SW 7062 ROCK BOTTOM HM DOORS AND FRAMES
P3 - SHERWIN WILLIAMS SW 7004 SNOWBOUND GYP CEILINGS
P4 - SHERWIN WILLIAMS SW 9179 ANCHORS AWEIGH EXP STRUCTURE

CEILING
ACT1 - ACOUSTIC CEILING TILES ARMSTRONG CEILING MESA 684 ANGLED TEGULAR 15/16 24"X48"X1" - WHITE
EXP - EXPOSED VINYL WRAPPED INSULATION
GYP - GYPSUM BOARD CEILINGS TO BE PAINTED P7 UNLESS NOTED OTHERWISE

CORNER GUARDS
CG1 - ACROVYN SM-10 #262 DRIFTWOOD TO BE USED ON WALLS PAINTED P1 FROM TOP OF BASE TO 6' OR 4' AT PONY WALLS

LAMINATE
L1 - WILSONART - 8214K-28 PHANTOM CHARCOAL GLOSS LINE FINISH SWC DOORS AND CABINETS
L2 - WILSONART - 4857-60 SHADOW ZEPHYR MATTE FINISH COUNTERTOPS

WALL BASE
RB - TARKETT - BASEWORKS 4" RUBBER COVE BASE 48 GREY WG

DOORS AND FRAMES
P5 - SHERWIN WILLIAMS SW 7062 ROCK BOTTOM HM DOORS AND FRAMES
L1 - WILSONART - 8214K-28 PHANTOM CHARCOAL GLOSS LINE FINISH SWC DOORS

WINDOW FRAMES
INTERIOR = ALUM. CLEAR ANODIZED
EXTERIOR = ALUM. CLEAR ANODIZED

FRP PANEL
FRP - MARLITE P151 LIGHTGRAY OR EQUAL PRODUCT

MATERIALS LEGEND

ACT1	-ACOUSTICAL CEILING TILE 2X2
ALUM	-ALUMINUM
BD	-BOARD
CG	-CORNER GUARD
CLG	-CEILING
CMU	-CONCRETE MASONRY UNIT
CPT	-CARPET
D&F	-DOORS AND FRAMES
EXP	-EXPOSED TO STRUCTURE
G	-GROUT
GL	-GLAZING
GYP	-GYPSUM
L	-LAMINATE
LVT	-LUXURY VINYL TILE
MLP	- METAL LINER PANEL
MTS	-METAL TRANSITION STRIP
MWL	-METAL WORKS LINEAR
OHD	-OVERHEAD DOORS
PCMU	-PAINTED CMU
PCONC	-PAINTED CONCRETE
PGB	-PAINTED GYP BOARD
RE	-REFERENCE
REFL	-REFLECTED
RB	-RUBBER COVE BASE
SC	-SEALED CONCRETE
SD	-SECTIONAL DOORS
SS	-SOLID SURFACE
STRUCT	-STRUCTURE
TL	-TILE
TP	-TOILET PARTITIONS
GR	-GRAVEL

ROOM FINISH SCHEDULE

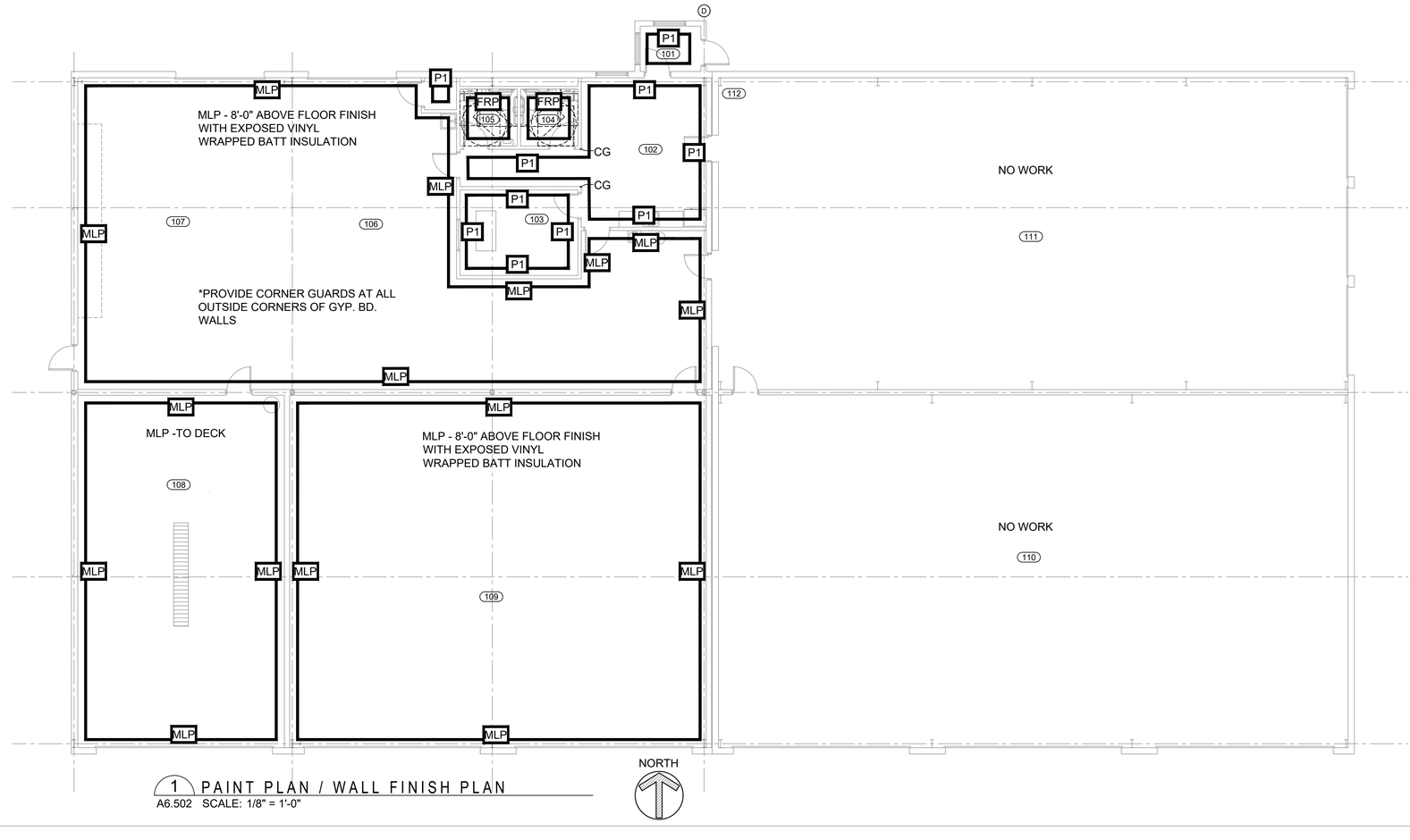
RM. NO.	ROOM NAME	FLOOR	BASE	WALLS				CEILING	REMARKS
				NORTH	EAST	SOUTH	WEST		
101	VESTIBULE	SC	RB	GL/PGB	PGB	PGB	GL/PGB	EXP	2
102	BREAK ROOM	SC	RB	PGB	PGB	PGB	PGB	ACT	1,2
103	OFFICE	SC	RB	PGB	PGB	PGB	PGB/GL	ACT	1,2
104	WOMEN	SC	RB	FRP	FRP	FRP	FRP	GYP	1,2,3
105	MEN	SC	RB	FRP	FRP	FRP	FRP	GYP	1,2,3
106	MOWER BAY	SC	-	MLP	MLP	MLP	MLP	EXP	1,2
107	SUBURBAN BAY	SC	-	MLP	MLP	MLP	MLP	EXP	1,2
108	WASH BAY	SC	-	MLP	MLP	MLP	MLP	EXP	1,2
109	BUS BAYS	SC	-	MLP	MLP	MLP	MLP	EXP	1,2
110	EXIST. BUS BAYS	EXISTING TO REMAIN							
111	EXIST. BUS BAYS	EXISTING TO REMAIN							
112	MECH. CLOSET	SC	RB	PGB	PGB	PGB	PGB	EXP	1,2

NUMBERED NOTES

1. REFER RCP FOR SPECIFIC DIRECTIVES WITH REGARDS TO CEILING LAYOUT.
2. REFER TO PAINT PLAN / WALL FINISH PLAN ON THIS SHEET FOR DIRECTIVES ON WALL FINISHES.
3. PROVIDE COAT HOOK ON BACK OF DOOR 5'-6" AFF. RE: MILLWORK SPECIFICATIONS.

GYPSUM BOARD NOTES:
A - PROVIDE IMPACT RESISTANT GYPSUM BOARD 8'-0" HIGH AFF AT ALL WALLS

CORNER GUARD NOTES:
A - PROVIDE CORNER GUARDS AT OUTSIDE CORNERS OF GYP. BOARD WALLS



1 PAINT PLAN / WALL FINISH PLAN
A6.502 SCALE: 1/8" = 1'-0"

Renaissance ARCHITECTURE, LLC
Bernie Rayner Colbert, Architect
11100 Stratford Drive, Suite A100
Oklahoma City, OK 73120-7200
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renaissancearchitecture.com

SEAL:
STATE OF OKLAHOMA BERNIE RAYNER COLBERT 19115 LICENSED ARCHITECT
08/11/2023

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS: MG
LABEL: DATE:

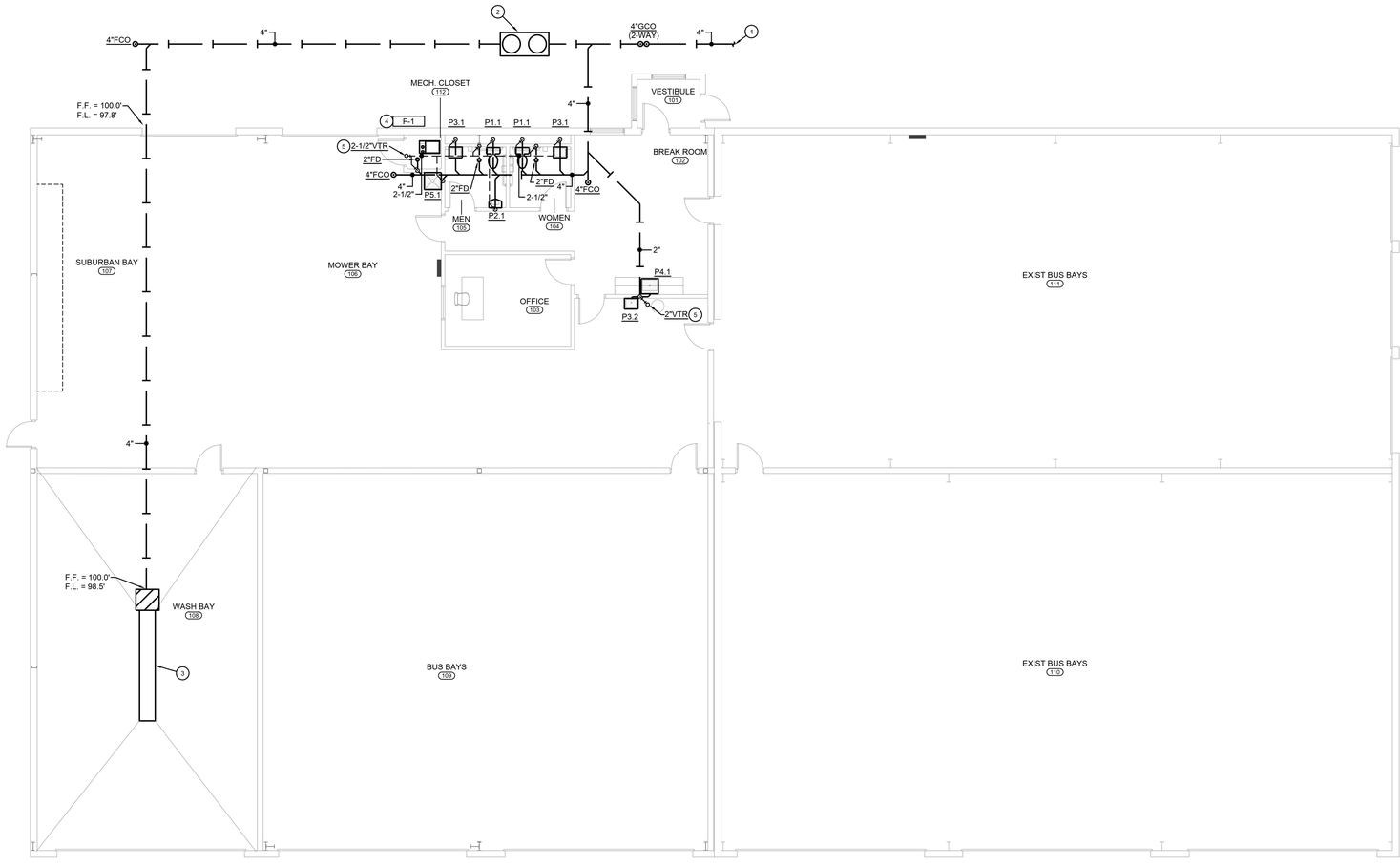
SHEET TITLE:
ROOM FINISH SCHEDULES AND COLOR SCHEDULE
DATE: 08-10-2023

SHEET NUMBER
A6.501

Date: Aug 10, 2023, 11:24am User ID: mzwirtz File: W:\PROJECTS\Education K12\Hennessey Public Schools\2020 Site Work\08_CDs\A6.501 - Room Finish Schedules and Color Schedule.dwg

PLAN NOTES:

1. REFER TO CIVIL SITE PLAN FOR CONTINUATION.
2. PROVIDE OIL/SAND INTERCEPTOR MODEL OS-100 BY STRIEM OR EQUAL. COORDINATE LOCATION WITH CIVIL SITE PLAN.
3. PROVIDE POLYDRAIN TRENCH DRAIN SYSTEM CHENNEL WITH MODEL 2507 DUCTILE IRON FRAME. LOAD CLASS E. PROVIDE SERIES 610 CATCH BASIN WITH DUCTILE IRON GRATE 2507.
4. EXTEND CONDENSATE DRAIN PIPING FROM FURNACE AND TERMINATE ABOVE FLOOR DRAIN WITH AIR GAP.
5. MAINTAIN MINIMUM 10'-0" SEPARATION BETWEEN VENT THROUGH ROOF AND ANY OUTSIDE AIR INTAKE.



A WASTE & VENT PLAN

0 4' 8' 16'

SCALE: 1/8" = 1'-0"

NORTH

23139.00-842
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349 South Hydraulic • Wichita, KS 67211
316.264.3588 • 316.264.3948 • www.iconengineers.net
OKLAHOMA REGISTRATION NUMBER 9882

SEAL:

EXPIRES: 3-31-2025

ICE JOB NUMBER - 23139.00 -842

HENNESSEY PUBLIC SCHOOLS
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HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

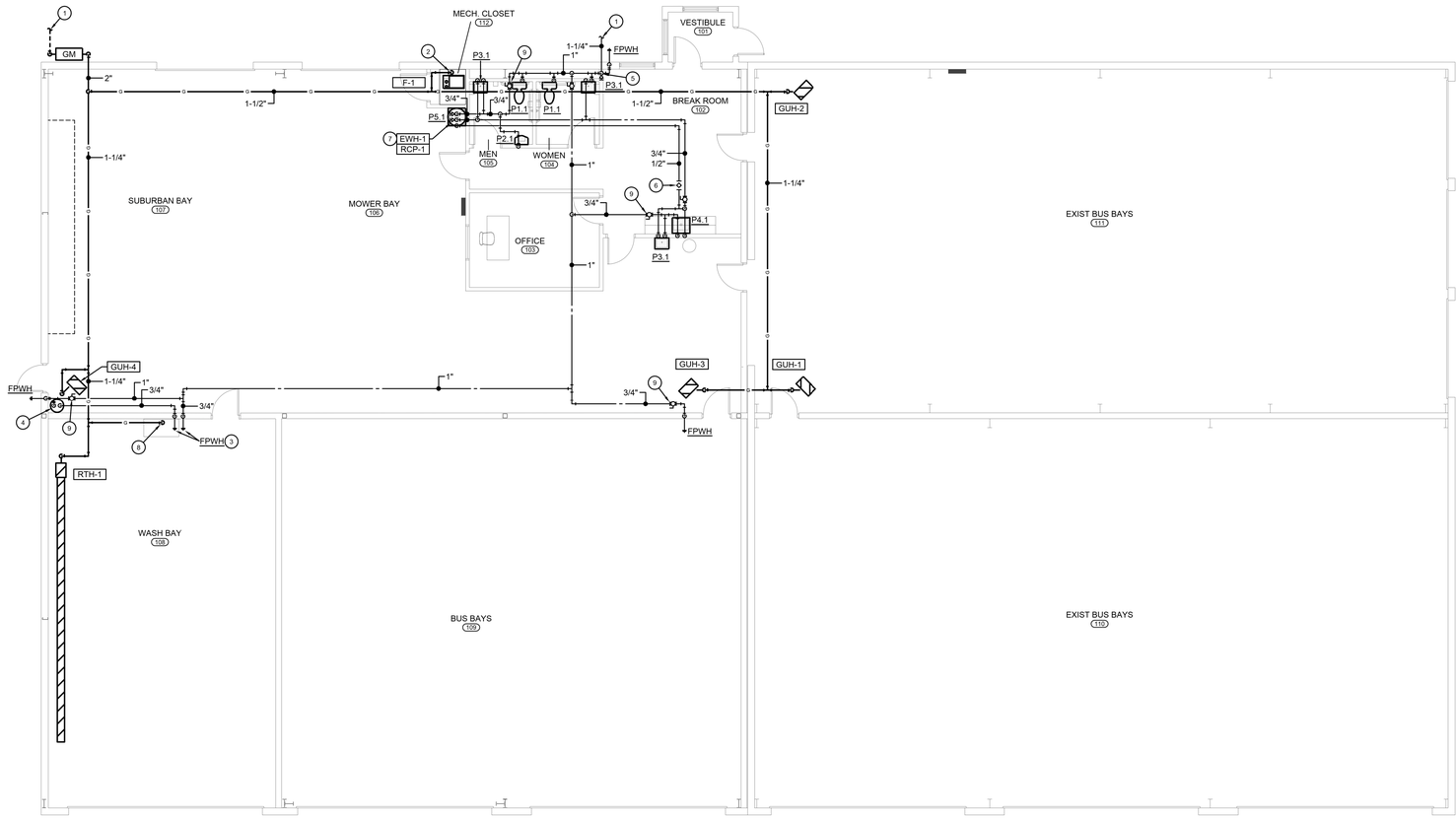
SHEET TITLE:
WASTE & VENT PLAN

DATE: 08-10-2023

SHEET NUMBER
P1.1

PLAN NOTES:

1. REFER TO CIVIL SITE PLAN FOR CONTINUATION.
2. EXTEND GAS PIPING DOWN TO EQUIPMENT AND CONNECT.
3. EXTEND WATER PIPING FROM WATER SOFTENER AND CONNECT TO FPWH. FPWH FOR OWNER PROVIDED HOTSY.
4. PROVIDE WATER SOFTENER. CONTACT LOCAL CULLIGAN REPRESENTATION FOR PROPER WATER SOFTENER SELECTION.
5. WATER BUILDING ENTRY LOCATED IN WALL. PROVIDE BUILDING SHUT OFF IN WALL. PROVIDE WALL ACCESS FOR VALVE.
6. PROVIDE CIRCUIT SETTER. BALANCE TO 0.5 GPM.
7. MOUNT WATER HEATER ON STAND ABOVE MOP BASIN. REFER TO DETAIL FOR ADDITIONAL INFORMATION.
8. DROP GAS PIPING DOWN AND CONNECT TO OWNER PROVIDED HOTSY PER MANUFACTURER'S RECOMMENDATIONS. VERIFY GAS LOAD AND SIZING REQUIRED FOR HOTSY PRIOR TO INSTALLATION OF GAS PIPING.
9. PROVIDE BALL VALVE (TYP.).



A PLUMBING PLAN

SCALE: 1/8" = 1'-0"

0 4' 8' 16'

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HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

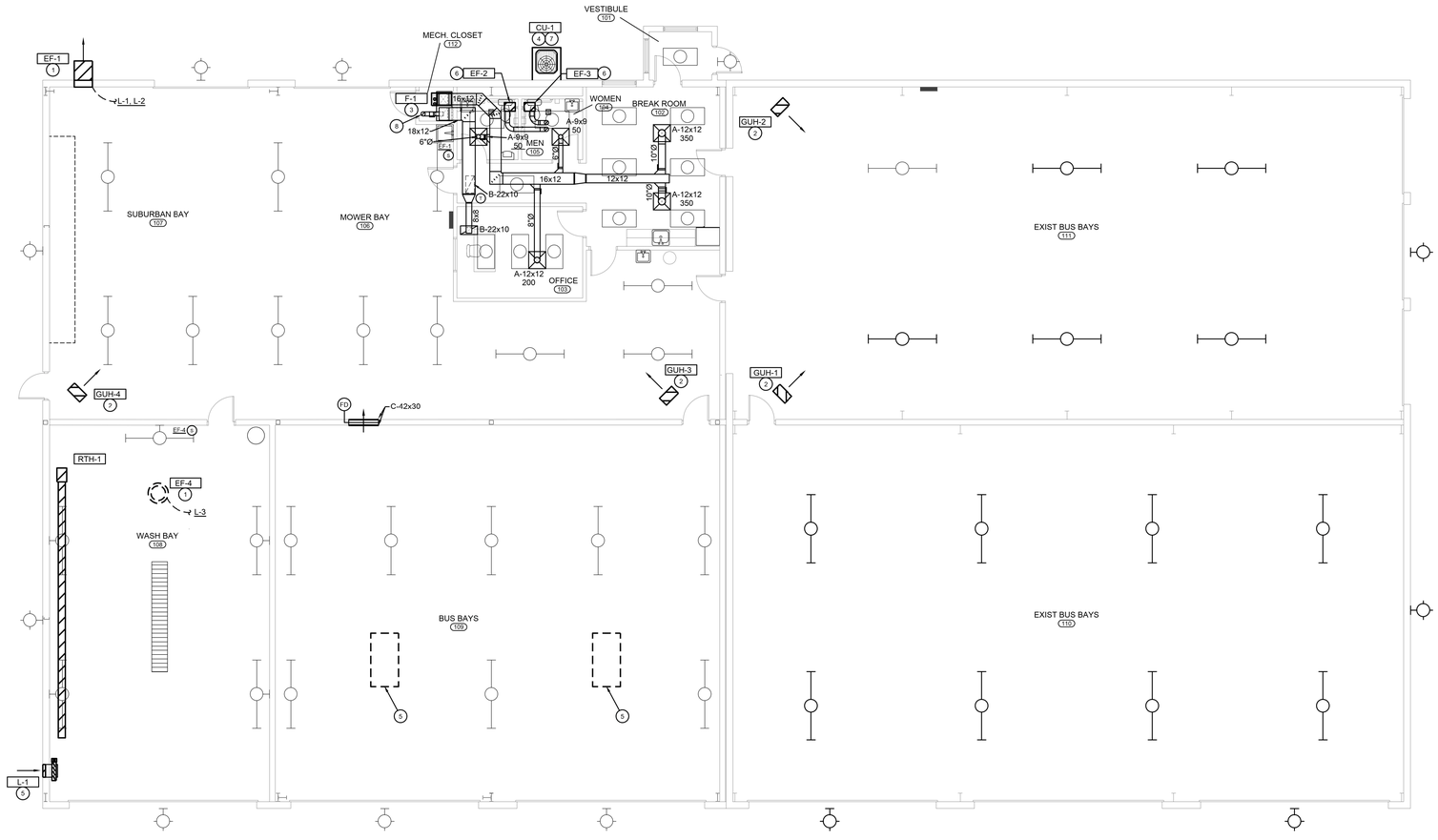
SHEET TITLE:
PLUMBING PLAN

DATE: 08-10-2023

SHEET NUMBER
P2.1

PLAN NOTES:

1. EXHAUST FAN TO BE CONTROLLED BY WALL SWITCH. INTERLOCK FAN START TO OPEN ASSOCIATED WALL LOUVER DAMPER.
2. EXTEND VENT AND INTAKE PIPING UP THROUGH ROOF AND TERMINATE PER MANUFACTURER'S RECOMMENDATIONS. ENSURE MINIMUM 10'-0" SEPARATION FROM ANY OUTSIDE AIR INTAKE.
3. PROVIDE PLENUM BOX BELOW FURNACE. REFER TO FURNACE DETAIL FOR ADDITIONAL INFORMATION.
4. G.C. TO PROVIDE 4" CONCRETE HOUSEKEEPING PAD.
5. PROVIDE MOTORIZED ON/OFF DAMPER OFF BOTTOM OF GRAVITY ROOF VENTILATOR. INTERLOCK DAMPER TO OPEN WHEN EF-1 STARTS.
6. EXTEND 6"ø EXHAUST DUCT UP TO ROOF AND TERMINATE WITH ROOF CAP. ENSURE MINIMUM 10'-0" SEPARATION FROM ANY OUTSIDE AIR INTAKE.
7. EXTEND AND CONNECT REFRIGERANT PIPING TO RESPECTIVE INDOOR COOLING COIL PER MANUFACTURER'S RECOMMENDATIONS. SEAL WALL PENETRATIONS WEATHER TIGHT.
8. EXTEND 6"ø OUTSIDE AIR DUCT UP TO ROOF AND TERMINATE WITH ROOF CAP.



A HVAC PLAN

SCALE: 1/8" = 1'-0"

0 4' 8' 16'

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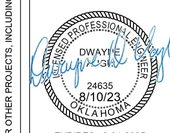


EXPIRES: 3-31-2025

ICE JOB NUMBER - 23139.00 -842

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

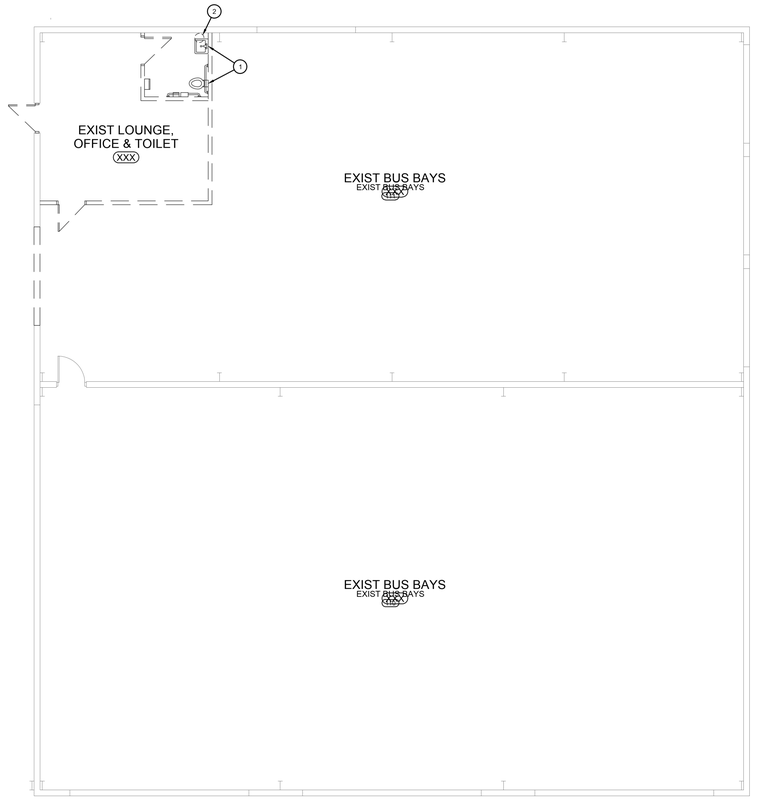
SHEET TITLE:
HVAC PLAN

DATE: 08-10-2023

SHEET NUMBER
M1.1

PLAN NOTES:

1. REMOVE PLUMBING FIXTURE AND PIPING IN THEIR ENTIRETY. CAP REMAINING PIPING AS REQUIRED.
2. REMOVE ELECTRIC HOT WATER HEATER LOCATED BELOW LAVATORY. CAP REMAINING PIPING AS REQUIRED.



A MECHANICAL DEMO PLAN

0 4' 8' 16'

SCALE: 1/8" = 1'-0"

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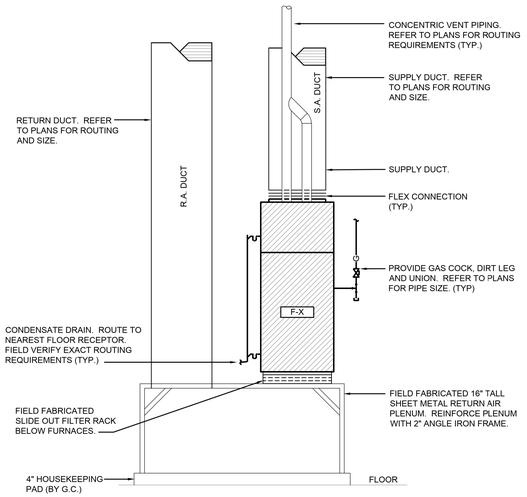
HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

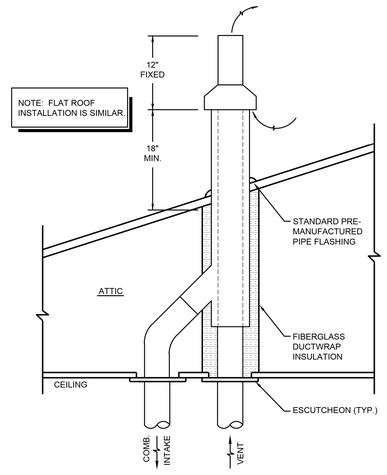
SHEET TITLE:
MECHANICAL
DEMO PLAN

DATE: 08-10-2023

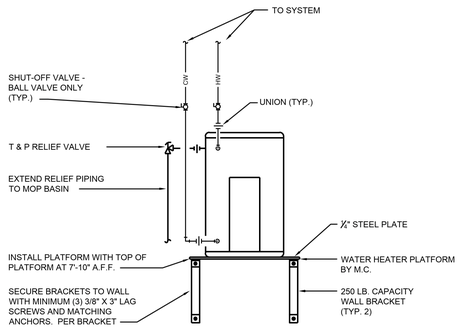
SHEET NUMBER
MD1.1



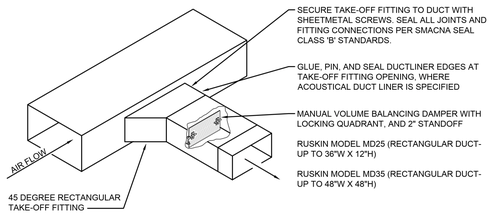
1 FURNACE DETAIL
NO SCALE



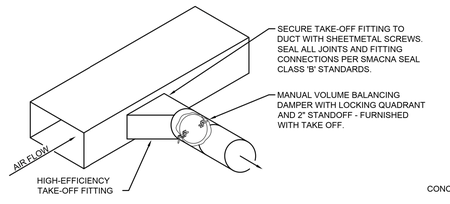
2 CONCENTRIC ROOF TERMINATION KIT DETAIL
NO SCALE



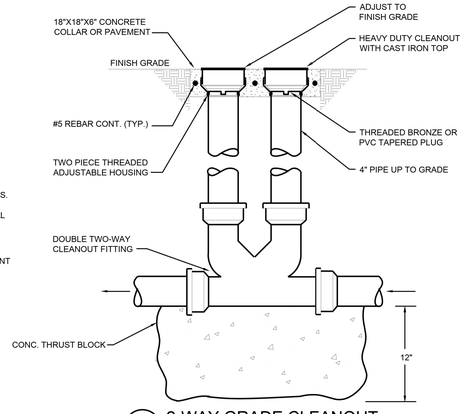
3 ELECTRIC WATER HEATER DETAIL
NO SCALE



4 RECTANGULAR DUCT TAKE-OFF DETAIL
NO SCALE



5 ROUND DUCT TAKE-OFF DETAIL
NO SCALE



6 2-WAY GRADE CLEANOUT
NO SCALE

PROJECT MECHANICAL DESIGN CRITERIA

ICE

PROJECT CITY: HENNESSEY, OKLAHOMA
PROJECT ELEVATION: 1,158 FT. ABOVE SEA LEVEL

GOVERNING CODES

BUILDING CODE: 2018 INTERNATIONAL BUILDING CODE
MECHANICAL CODE: 2018 INTERNATIONAL MECHANICAL CODE
PLUMBING CODE: 2018 INTERNATIONAL PLUMBING CODE
ELECTRICAL CODE: 2020 NATIONAL ELECTRIC CODE
FIRE CODE: 2018 INTERNATIONAL FIRE CODE

COOLING WEATHER DESIGN DATA

DESIGN WEATHER STATION: VANCE AFB
DESIGN WEATHER BASIS: ASHRAE 0.4%

DESIGN DRY BULB: 101.7° F
MEAN COINC. WET BULB: 73.4° F

DESIGN WET BULB: 77.0° F
MEAN COINC. DRY BULB: 81.6° F

HEATING WEATHER DESIGN DATA

DESIGN WEATHER BASIS: ASHRAE 99.6%
DESIGN DRY BULB: 10.9° F

ENERGY DATA

ASHRAE CLIMATE ZONE: 3A
COOLING DEGREE DAYS(65): 2,017
HEATING DEGREE DAYS(65): 3,908

DEMOLITION GENERAL NOTES

ICE

1. PLANS ARE SCHEMATIC IN NATURE. LAYOUT IS BASED ON BEST AVAILABLE INFORMATION. PRIOR TO SUBMITTING BID CONTRACTOR SHALL VISIT JOB SITE AND BECOME FULLY ACQUAINTED WITH EXISTING CONDITIONS OF PROJECT. NOTIFY ARCHITECT AND/OR ENGINEER OF CONFLICTS OR DISCREPANCIES PRIOR TO SUBMISSION OF BID.
2. ALL CUTTING, PATCHING AND DEMOLITION WORK SHALL BE CLOSELY COORDINATED WITH EXISTING CONDITIONS AND THE REQUIRED NEW WORK.
3. PORTIONS OF SYSTEMS ARE SHOWN FOR CLARITY, EVEN THOUGH IT MAY NOT BE NECESSARY TO MODIFY OR REVISE THEM. ALL EXISTING SYSTEMS ARE SHOWN BASED ON ORIGINAL BUILDING DRAWINGS AND FIELD OBSERVATIONS.
4. ALL WORK MUST BE COORDINATED AND SCHEDULED WITH THE EMPLOYEES AND OWNER OF THE BUILDING SO AS TO PROVIDE THE LEAST AMOUNT OF DISRUPTION OF BUILDING ACTIVITIES AS POSSIBLE.
5. THESE DRAWINGS ARE ACCOMPANIED BY SPECIFICATIONS. REFER TO THE SPECIFICATIONS FOR ADDITIONAL INFORMATION.
6. ALL EXISTING DUCTWORK TO BE RE-USED AS A PART OF THE COMPLETED PROJECT TO BE PATCHED AND SEALED AIR AND WATERTIGHT AND RE-INSULATED WHERE REQUIRED TO PLACE IN LIKE NEW CONDITIONS. COORDINATE WITH THE REQUIRED NEW WORK.
7. THE OWNER SHALL HAVE THE OPTION TO KEEP ANY EQUIPMENT THAT IS TO BE REMOVED. OTHERWISE, IT IS TO BE DISPOSED OF BY THIS CONTRACTOR.

MECHANICAL GENERAL NOTES

ICE

1. PLANS ARE SCHEMATIC IN NATURE. LAYOUT IS BASED ON BEST AVAILABLE INFORMATION. PRIOR TO SUBMITTING BID CONTRACTOR SHALL VISIT JOB SITE AND BECOME FULLY ACQUAINTED WITH EXISTING CONDITIONS OF PROJECT. NOTIFY ARCHITECT AND/OR ENGINEER OF CONFLICTS OR DISCREPANCIES PRIOR TO SUBMISSION OF BID.
2. COORDINATE INSTALLATION OF MECHANICAL SYSTEMS WITH OTHER TRADES TO ENSURE NEAT AND ORDERLY INSTALLATION.
3. FIELD MEASURE FINAL DUCTWORK AND PIPING LOCATIONS PRIOR TO FABRICATION AND MAKE ADJUSTMENTS AS REQUIRED. MAINTAIN MANUFACTURER'S RECOMMENDATIONS REGARDING SERVICE CLEARANCE AND PROPER AIRFLOW CLEARANCE AROUND EQUIPMENT.
4. ADJUST LOCATION OF CEILING DIFFUSERS, REGISTERS AND GRILLES AS REQUIRED TO ACCOMMODATE FINAL CEILING GRID, STRUCTURE AND LIGHTING LOCATIONS.
5. ALL DIFFUSERS ARE 4-WAY BLOW UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
6. COORDINATE ACCESS TO EQUIPMENT, VALVES, AND DAMPERS INSTALLED ABOVE 'INACCESSIBLE' CEILINGS AND IN CHASES, ETC. WITH GENERAL CONTRACTOR. PROVIDE LOCKING ACCESS DOORS FOR INSTALLATION BY GENERAL CONTRACTOR AS REQUIRED TO SERVICE CONCEALED EQUIPMENT, VALVES, AND DAMPERS. CEILING ACCESS DOORS FOR FIRE DAMPERS, AND FIRE SMOKE DAMPERS FURNISHED BY THIS CONTRACTOR AND INSTALLED BY GENERAL CONTRACTOR.
7. MAINTAIN MINIMUM 10'-0" CLEARANCE BETWEEN OUTSIDE AIR INTAKES AND EXHAUST/VENT TERMINATIONS.
8. A MAXIMUM LENGTH OF 5'-0" FLEX DUCT MAY BE USED AT EACH RUNOUT TO SUPPLY DIFFUSERS. FLEX DUCT SHALL NOT BE USED IN RETURN OR EXHAUST APPLICATIONS AND ONLY IN CONCEALED LOCATIONS.
9. RECTANGULAR & ROUND DUCT SIZES INDICATED ARE INSIDE CLEAR DIMENSIONS. SEE SPECIFICATIONS FOR DUCTLINER / INSULATION REQUIREMENTS.
10. DO NOT ROUTE DUCTWORK OR PIPING ABOVE ELECTRICAL PANELS OR ELECTRICAL GEAR. COORDINATE ROUTING WITH OTHER TRADES.
11. NEW HVAC EQUIPMENT SHALL NOT BE USED DURING CONSTRUCTION. CONTRACTOR SHALL FURNISH ALL NECESSARY TEMPORARY HEATING / COOLING EQUIPMENT AND CONTROLS AS REQUIRED.
12. INSTALL BALANCING DAMPERS (UNLESS PROVIDED WITH GRILLES/DIFFUSERS) IN EACH GRILLE/DIFFUSER DUCT RUNOUT. LOCATE DAMPERS ABOVE ACCESSIBLE CEILINGS OR IN ACCESSIBLE AREAS.
13. INSTALL TURNING VANES IN ALL RECTANGULAR DUCT ELBOWS.
14. PROVIDE FIRE AND/OR FIRE-SMOKE DAMPERS AT ALL RATED WALLS OR CEILINGS WHETHER IT IS NOTED ON PLANS OR NOT.
15. ALL NEW THERMOSTATS SHALL BE PLACED AT 4'-0" MAXIMUM ABOVE FINISHED FLOOR PER ADA REQUIREMENTS. VERIFY HEIGHTS WITH OWNER PRIOR TO FINAL INSTALLATION.

PLUMBING GENERAL NOTES

ICE

1. PLANS ARE SCHEMATIC IN NATURE. LAYOUT IS BASED ON BEST AVAILABLE INFORMATION. PRIOR TO SUBMITTING BID CONTRACTOR SHALL VISIT JOB SITE AND BECOME FULLY ACQUAINTED WITH EXISTING CONDITIONS OF PROJECT. NOTIFY ARCHITECT AND/OR ENGINEER OF CONFLICTS OR DISCREPANCIES PRIOR TO SUBMISSION OF BID.
2. COORDINATE INSTALLATION OF PLUMBING SYSTEMS WITH OTHER TRADES TO ENSURE NEAT AND ORDERLY INSTALLATION.
3. FIELD MEASURE FINAL PIPING LOCATIONS PRIOR TO FABRICATION AND MAKE ADJUSTMENTS AS REQUIRED. MAINTAIN MANUFACTURER'S RECOMMENDATIONS REGARDING SERVICE CLEARANCE AND PROPER AIRFLOW CLEARANCE AROUND EQUIPMENT.
4. COORDINATE ROUTING OF PLUMBING AND FIRE PROTECTION PIPING WITH DUCTWORK, LIGHTS, ARCHITECTURAL CEILING AND STRUCTURAL ELEMENTS. PIPING SHALL RISE AND DROP, JOG OR OFFSET AS REQUIRED TO AVOID CONFLICTS. DUCTWORK SHALL TAKE PRECEDENCE OVER ALL PIPING, INCLUDING FIRE SPRINKLER PIPING EXCEPT WHERE GRADE MUST BE MAINTAINED FOR DRAINAGE. PROVIDE ADDITIONAL MANUAL AIR VENTS FOR PIPING WHERE REQUIRED FOR PIPING TO OFFSET. FIRE PROTECTION CONTRACTOR SHALL PROVIDE ADDITIONAL DRAINS AS REQUIRED TO DRAIN SYSTEM.
5. NO PIPING SHALL PENETRATE STRUCTURAL MEMBERS.
6. WALL CLEANOUT AND ACCESS DOORS SHALL MATCH ADJACENT SURFACES.
7. MAINTAIN MINIMUM 10'-0" CLEARANCE BETWEEN OUTSIDE AIR INTAKES AND EXHAUST/VENT TERMINATIONS.
8. DO NOT ROUTE PIPING ABOVE ELECTRICAL PANELS OR ELECTRICAL GEAR. COORDINATE ROUTING WITH OTHER TRADES.
9. ALL WALL CAPS SHALL BE PAINTED TO MATCH WALL. ROOF CAPS AND VENTS SHALL BE PAINTED, COLOR SELECTED BY ARCHITECT.
10. PROVIDE WCO AT BASE OF ALL WASTE STACKS INCLUDING LAVATORIES AND SINKS.
11. THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS FOR ROUTING AND CONNECTION OF SANITARY SEWER / WATER / GAS SERVICES. COORDINATE WITH LOCAL UTILITIES AND AUTHORITIES WHERE REQUIRED.
12. REFER TO PLUMBING FIXTURE SCHEDULE FOR PIPING RUNOUT SIZES TO INDIVIDUAL PLUMBING FIXTURES.
13. CONTRACTOR SHALL VERIFY ALL CONNECTION REQUIREMENTS TO EQUIPMENT PROVIDED BY OTHERS WITH ACTUAL EQUIPMENT PROVIDED ON SITE.

MECHANICAL LEGEND

(NOT ALL SYMBOLS LISTED BELOW ARE BEING USED IN THIS SET OF MECHANICAL DRAWINGS)

ICE

SYMBOL	ABBR	DESCRIPTION
HVAC:		
		DIFFUSER
	RAG	RETURN AIR GRILLE
		HATCH INDICATES BLANKED SECTION
		NEW DUCTWORK
		EXISTING DUCTWORK
		EXISTING DUCTWORK TO BE REMOVED
		SUPPLY DUCT UP
		ROUND DUCT UP
		SUPPLY DUCT DOWN
		RETURN OR EXHAUST DUCT DOWN
		ROUND DUCT DOWN
		RECTANGULAR VANED ELBOW
		ROUND ELBOW
		MITERED ROUND ELBOW
		CONCENTRIC TRANSITION
		ECCENTRIC TRANSITION
		SQUARE TO ROUND TRANSITION
		DUCT DROP/RISE IN DIRECTION OF ARROW
		45° TAKEOFF FITTING
		45° TAKEOFF FITTING WITH MANUAL VOLUME DAMPER
	MVD	MANUAL VOLUME DAMPER WITH LOCKING QUADRANT
	MD	MOTORIZED DAMPER
	FD	FIRE DAMPER
	FS	COMBINATION FIRE/SMOKE DAMPER

SYMBOL	ABBR	DESCRIPTION
PIPING:		
	CW	DOMESTIC COLD WATER
	HW	DOMESTIC HOT WATER
140°	140°	DOMESTIC 140° HOT WATER
	HWC	DOMESTIC HOT WATER CIRCULATING
	SAN	SANITARY WASTE ABOVE FLOOR
	SAN	SANITARY WASTE BELOW FLOOR
	V	SANITARY VENT
RD	RD	ROOF DRAIN
RD	RD	ROOF DRAIN BELOW FLOOR
ORD	ORD	ROOF OVERFLOW
FP	FP	FIRE PROTECTION
G	G	NATURAL GAS
CWS	CWS	CHILLED WATER SUPPLY
CWR	CWR	CHILLED WATER RETURN
HWS	HWS	HEATING WATER SUPPLY
HWR	HWR	HEATING WATER RETURN
D	D	CONDENSATE DRAIN
GW	GW	GREASE WASTE
RL	RL	REFRIGERANT LIQUID
RS	RS	REFRIGERANT SUCTION
RHG	RHG	REFRIGERANT HOT GAS
S	S	STEAM SUPPLY (10 PSI)
CR	CR	CONDENSATE RETURN
A	A	COMPRESSED AIR
		ELBOW UP
		ELBOW DOWN
		TEE UP
		TEE DOWN
		PIPE CAP OR PLUG

SYMBOL	ABBR	DESCRIPTION
PLUMBING EQUIP.		
		SHUT-OFF VALVE (GATE VALVE NOT ALLOWED)
		BALL VALVE
		BUTTERFLY VALVE
		BALANCING VALVE
		CHECK VALVE
		STRAINER
		GAS COCK
		PIPING UNION
		PIPE REDUCER
		VALVE IN RISER
	HB	HOSE BIBB
	WH	WALL HYDRANT
	FPWH	FREEZE PROOF WALL HYDRANT
	RD	ROOF DRAIN
	ORD	OVERFLOW ROOF DRAIN
	AD	AREA DRAIN
	BD	BOILER DRAIN
	FD	FLOOR DRAIN
	WCO	WALL CLEANOUT
	FCO	FLOOR CLEANOUT
	FS	FLOOR SINK
	VTR	VENT THRU ROOF
D M3.1		ENLARGED PLAN CALLOUT

SYMBOL	ABBR	DESCRIPTION
SYMBOLS:	P1.1	PLUMBING FIXTURE NUMBER
F-1	F-1	EQUIPMENT DESIGNATION
1		SHEET NOTE
	POC	POINT OF CONN. (CONN. NEW TO EXISTING)
	DN	DOWN
	TOD	TOP OF DUCT (ABOVE FIN. FLOOR)
	BOP	BOTTOM OF PIPE
	NTS	NOT TO SCALE
	A.F.F.	ABOVE FINISHED FLOOR
	C.A.	COMBUSTION AIR
	O.A.	OUTSIDE AIR
	E.A.	EXHAUST AIR
	S.A.	SUPPLY AIR
	R.A.	RETURN AIR
	R.A.G.	RETURN AIR GRILLE
	T.A.G.	TRANSFER AIR GRILLE
	O.B.D.	OPPOSED BLADE DAMPER
	W.P.L.	WEATHER PROOF LOUVER
	G.C.	GENERAL CONTRACTOR
	M.C.	MECHANICAL CONTRACTOR
	P.C.	PLUMBING CONTRACTOR
	E.C.	ELECTRICAL CONTRACTOR
T	T	THERMOSTAT/SENSOR
H	H	HUMIDISTAT/SENSOR
	F.P.C.	FIRE PROTECTION CONTRACTOR
	T.C.C.	TEMPERATURE CONTROLS CONTRACTOR

GAS LOAD SCHEDULE

ICE

EQUIPMENT	GAS INPUT (MBH)	RUNOUT SIZE
GUH-1	100	1"
GUH-2	100	1"
GUH-3	100	1"
GUH-4	100	1"
RTH-1	65	3/4"
F-1	40	3/4"
HOTSY (BY OWNER)	100*	1"
TOTAL CFH		605

NOTES

1. ALL REGULATORS, GAS-COCKS, UNIONS, ETC. SHALL BE LINE SIZE OF GAS PIPING (MINIMUM).
2. GAS COMPANY TO PROVIDE LOW PRESSURE GAS FROM MAIN METER LOCATION.
3. ALL LOW PRESSURE GAS PIPE SIZES ARE BASED ON NATURAL GAS: 7" W.C., 0.5 PSI (MAX.), 0.6 SPECIFIC GRAVITY AND 0.5" W.C. PRESSURE DROP.
4. IF DEVELOPED LENGTH (200 FT) OF GAS PIPING VARIES FROM DESIGN, PLUMBING CONTRACTOR SHALL NOTIFY ENGINEER FOR VERIFICATION OF ALL PIPE SIZING. P.C. SHALL VERIFY THAT GAS SYSTEM PRESSURE DOES NOT EXCEED ALLOWABLE LIMITS OF GAS UTILIZATION EQUIPMENT.

*GAS LOAD TO BE VERIFIED WITH OWNER PROVIDED EQUIPMENT PRIOR TO INSTALLATION.

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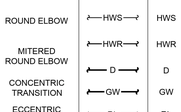
OKLAHOMA REGISTRATION NUMBER 5682
23139.00-842

SEAL:



EXPIRES: 3-31-2025

ICE JOB NUMBER - 23139.00 -842

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

SHEET TITLE:
MECHANICAL DESIGN CRITERIA

DATE: 08-10-2023

SHEET NUMBER
MP1.0

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PLUMBING FIXTURE SCHEDULE

ICE

P-NO.	FIXTURE	MAN.	MODEL	SIZE	MATERIAL	MOUNTING	MOUNTING HEIGHTS	FLUSH VALVE/TANK	NO. OF FAUCET HOLE	ADA COMPLIANT	CARRIER	TRIM					ROUGH-IN SIZES					NOTES
												FAUCET/ VALVE MAN.	FAUCET/ VALVE MODEL	STRAINER	HOSE & SPRAY	SOAP DISP	WASTE		VENT	WATER		
																	ABOVE GND.	BELOW GND.		HOT	COLD	
P1.1	WATER CLOSET	KOHLER	K-3979	N/A	VC	F	1	T	--	●	--	----	---	--	--	--	---	4"	2"	---	1/2"	1,2
P2.1	URINAL	KOHLER	K-4991-ET	N/A	VC	W	2	V	--	●	●	SLOAN ROYAL	186-1.0	--	--	--	2"	2"	1 1/2"	---	3/4"	1
P3.1	LAVATORY	KOHLER	K-2005	21"x18"	VC	W	3	--	3	●	●	DELTA	22C531	1	--	--	1 1/2"	2"	1 1/2"	1/2"	1/2"	3,4
P3.2	HANDSINK	ELKAY	SEHS-17X	17"x15"	SS	W	3	--	2	--	●	----	---	1	--	--	1 1/2"	2"	1 1/2"	1/2"	1/2"	3,4
P4.1	SINGLE COMP. SINK	ELKAY	LR2219	22"x19"	SS	C	--	--	3	--	--	DELTA	27C2934-R7	1	--	--	1-1/2"	2"	1-1/2"	1/2"	1/2"	5
P5.1	MOP BASIN	FIAT	MSB-2424	24"x24"x10"	MS	F	--	--	--	--	--	DELTA	28T9	--	--	--	---	3"	1 1/2"	3/4"	3/4"	6
P6.1	ICE BOX																					

SCHEDULE LEGEND

MATERIAL

VC	VITREOUS CHINA
SS	STAINLESS STEEL
MS	MOLDED STONE

MOUNTING

F	FLOOR MOUNTED
W	WALL HUNG
C	COUNTER MOUNTED

MOUNTING HEIGHTS

1. TOP OF SEAT AT 19" MAX. (ADA)
2. LIP AT 17" A.F.F. - VALVE OPERATOR AT 48" A.F.F. MAX. (ADA)
3. RIM AT 34" A.F.F. MAX. (ADA)

STRAINER TYPE

1. GRID

NOTES:
1. PROVIDE WITH TRIP LEVER ON WIDE SIDE OF FIXTURE.
2. PROVIDE WITH WHITE OPEN-FRONT SEAT, LESS COVER.
3. PROVIDE AND INSTALL TRUEBRO MODEL 103 INSULATION, WITH ONE P-TRAP COVER, TWO ANGLE VALVE AND SUPPLY COVERS, AND ONE OFFSET TAILPIECE WHEEL CHAIR COVER. FIXTURES EQUIPPED WITH ARCHITECTURAL KNEE / UNDER-COUNTER SHROUDS DO NOT REQUIRE INSULATION.
4. PROVIDE LEAD-FREE POWERS LFE480 MIXING VALVE (OR EQUAL) TO MAINTAIN LAVATORY TEMPERATURE AT 110°F.
5. SUPPLY FAUCET WITH RIGID SPOUT.
6. PROVIDE MOP HANGER, HOSE AND HOSE BRACKET, AND STAINLESS STEEL WALL GUARD.

WATER HEATER SCHEDULE

ICE

MARK	TYPE	STOR. CAP. GALLONS	RECOVERY G.P.H. (G.P.M.)	DEG. RISE	GAS					ELECTRIC			EXP. TANK	MODEL
					INPUT MBH	VENT DIA.	INTAKE DIA.	BURNER		NO. OF ELEMENTS	ELEMENT KW	VOLTAGE		
								HP	AMPS					
EWH-1	TANK	30	21	90°	--	--	--	--	--	2	4.5	240/1ø	--	ENS-30

NOTES:
1. ELECTRIC WATER HEATER SELECTION BASED ON A.O. SMITH PROLINE ELECTRIC WATER HEATERS.
2. ELECTRICAL ELEMENTS TO OPERATE NON-SIMULTANEOUS.

PUMP SCHEDULE

ICE

MARK	MANUF.	MODEL	SERVICE	TYPE	GPM	HEAD (FT)	EFFICIENCY	MOTOR			NOTES
								ELECT.	HP (W)	RPM	
RCP-1	B&G	NBF-33	DOM HW	RECIRC.	15	7	--	120/1ø/60	1/6	2950	--

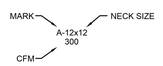
NOTES:
1. BASED ON BELL & GOSSETT RECIRCULATING PUMP.

GRILLES, REGISTERS, & DIFFUSERS SCHEDULE

ICE

MARK	USE	LOCATION	FINISH	MATERIAL	MOUNTING	NECK SIZE	FACE SIZE	MODEL NO.	ACCESSORIES	NOTES
A	SUPPLY	CEILING	WHITE	STEEL	LAY-IN	SEE DWG.	SEE DWG.	TDC	--	24x24 LAY-IN PANEL
B	RETURN	CEILING	WHITE	ALUMINUM	LAY-IN	SEE DWG.	22x10	50F	--	24x12 LAY-IN PANEL
C	TRANSFER	WALL	WHITE	STEEL	SURFACE	SEE DWG.	SEE DWG.	350RL	O.B.D.	5

NOTES:
1. MODEL NUMBERS ARE BASED ON TITUS.
2. CALLOUTS ON DRAWINGS INDICATE NECK SIZE, CFM, AND SCHEDULE MARK.
3. M.C. SHALL FABRICATE NECESSARY RECTANGULAR TO ROUND ADAPTERS AT ALL GRILLE CONNECTIONS.
4. ALL SURFACES VISIBLE THROUGH FACE OF GRILLE/DIFFUSER SHALL BE PAINTED FLAT BLACK.
5. MOUNT GRILLE WITH BLADES FACING UP



FURNACE SCHEDULE

ICE

MARK	TYPE	HEAT (MBH)		EVAPORATOR				BLOWER					VENT PIPE DIA. (IN.)	INTAKE PIPE DIA. (IN.)	MODEL NUMBERS	
		INPUT	OUTPUT	MBH	PD (IN.)	ROWS	AREA	CFM	ESP (IN.)	HP	FAN SPEED	ELECTRICAL			FURNACE	DX COIL
F-1	UPFLOW	40	38.8	30	0.3	2	4.5 SF	1000	0.5	1/2	HIGH	120/1/60	2	2	S9X1B040U3	4TXCB003D

NOTES:
1. UPFLOW FURNACE SELECTIONS ARE BASED ON TRANE SERIES S9X1 (96% MIN. EFFICIENCY) GAS-FIRED SEALED COMBUSTION FURNACES WITH MATCHING CASED EVAPORATOR COILS.
2. COOLING CAPACITIES ARE BASED ON AHRI CONDITIONS.
3. FAN SPEED INDICATED IS FOR BOTH COOLING AND HEATING.
4. SCHEDULED BLOWER EXTERNAL STATIC PRESSURE INCLUDES EVAPORATOR COIL AND CLEAN FILTER PRESSURE DROPS.

CONDENSING UNIT SCHEDULE

ICE

MARK	MATCH W/ UNIT #	MANUF.	MODEL	CAPACITY		COMP. (EA)		CONDENSER FANS (EA)				COIL		ELECTRICAL			ACCESSORIES												SEER
				TMBH	SMBH	NO.	RLA	NO.	HP	FLA	AMBIENT	SQ. FT.	ROWS	VOLT.	MCA	MOCP	ANTI-SHORT CYCLE TIMER	OVERLOAD PROTECTION	LOW AMBIENT KIT [0 DEGREES]	HIGH PRESSURE SWITCH	HIGH/LOW PRESSURE/TEMP CONTROL	CRANKCASE HEATER	LIQUID LINE FILTER DRYER	SIGHT GLASS W/ MOIST INDICATOR	START KIT	INTERNAL ISOLATION		
CU-1	F-1	TRANE	4TTR5030	30	----	1	12.8	1	1/8	0.64	105	---	---	230/1	17	25	●	●	●	●	●	●	●	●	●	●		15

NOTES:
1. REFRIGERANT PIPING SHALL BE SIZED FOR ACTUAL INSTALLED LENGTH AND CONFIGURATION BY UNIT MANUFACTURER.
2. COOLING CAPACITIES ARE BASED ON 80 DEG. F DB / 67 DEG. F WB INDOOR AIR, 95 DEG. F DB OUTDOOR AIR.

RADIANT TUBE HEATER SCHEDULE

ICE

MARK	STYLE	MANUF.	MODEL NUMBER	NOMINAL LENGTH	TUBE DIAMETER	INPUT (MBH)	MOUNTING ANGLE	ELECTRICAL		NOTES
								FLA	VOLTAGE	
RTH-1	STRAIGHT	SOLARONICS	SSTG 65-30BN	30	4"	65	45°	---	120/1/60	WASH BAY

NOTES:
1. RADIANT TUBE HEATER TO BE RATED FOR WET ENVIRONMENTS

GAS UNIT HEATER SCHEDULE

ICE

MARK	MANUF.	MODEL	TYPE	FAN			HEATING		INTAKE DIA.	FLUE DIA.	NOTES
				CFM	HP	ELECT.	INPUT (MBH)	OUTPUT (MBH)			
GUH-1	STERLING	XF100	PROP.	1600	0.1	120/1/60	100	83	5"	5"	---
GUH-2	STERLING	XF100	PROP.	1600	0.1	120/1/60	100	83	5"	5"	---
GUH-3	STERLING	XF100	PROP.	1600	0.1	120/1/60	100	83	5"	5"	---
GUH-4	STERLING	XF100	PROP.	1600	0.1	120/1/60	100	83	5"	5"	---

NOTES:
1. SELECTION BASED ON STERLING HIGH EFFICIENCY UNIT HEATERS

FAN SCHEDULE

ICE

MARK	TYPE	MANUF.	MODEL NUMBER	CFM	E.S.P. (IN.)	AIR TEMP DEG.	SONES	FAN				MOTOR		FAN CONTROL							NOTES
								RPM	TIP SPEED	O.V.	DRIVE	HP (MAX. WATTS)	ELECTRICAL	SWITCH W/LIGHTS	PILOTED WALL SWITCH	THERMOSTAT CONTROLLED	DDC CONTROLS	KITCHEN HOOD	CONTINUOUS OPERATION	DISHWASHER CONTROL CIRCUIT	
EF-1	WALL	COOK	24XP32D10	4050	0.25	95	16.0	1050	----	---	DIRECT	3/4	120/1/60	--	●	--	--	--	--	--	--
EF-2	CEILING	COOK	GC-166	70	0.25	75	0.8	1100	----	---	DIRECT	(28.6W)	120/1/60	●	--	--	--	--	--	--	--
EF-3	CEILING	COOK	GC-166	70	0.25	75	0.8	1100	----	---	DIRECT	(28.6W)	120/1/60	●	--	--	--	--	--	--	--
EF-4	ROOF	COOK	120C15D	850	0.25	95	5.3	1550	----	---	DIRECT	1/4	120/1/60	--	●	--	--	--	--	--	--

NOTES:
1. MODEL NUMBERS ARE BASED ON COOK FANS.
2. SEE SPECIFICATIONS FOR FAN TYPES AND ACCESSORIES.
3. ALL SWITCHES, INTERLOCKS, RELAYS, TRANSFORMERS, TIMECLOCKS, ETC., SHALL BE FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR. SEE ELECTRICAL PLANS.
4. ALL BELT DRIVE FAN SELECTIONS SHALL INCLUDE DRIVE LOSSES.

LOUVER SCHEDULE

ICE

MARK	MFG.	MODEL	SIZE (WXH)(IN.)	SERVICE	ROOM	MATERIAL	FRAME / BLADE THICKNESS	DEPTH	FREE AREA (SF MIN.)	MAX. FREE AREA VELOCITY (FPM)	CFM	PRESSURE DROP (IN.)	NOTES
L-1	RUSKIN	ELF375DXH	18x18	INTAKE	BUS BAYS	ALUMINUM	0.125"/0.125"	4"	0.96	885	850	0.116	1

NOTES:
1. PROVIDE MOTORIZED DAMPER INTERLOCKED WITH EF-4 OPERATION. MOTORIZED DAMPER TO OPEN ON EF-4 START SIGNAL (DELAY OPERATION START OF EF-4 FOR 10 SECONDS AFTER EF-4 START SIGNAL). MOTORIZED DAMPER TO CLOSE ON EF-4 STOP.

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EQUIPMENT CONNECTION SCHEDULE

ICE

SCH. CODE
SW=DISC. SW
CB=CIR.BKR.
T=TOGGLE SW.

UNIT DESIG.	120/60/1	240/60/1	LOAD H.P.	LOAD FLA	LOAD MCA	PANEL DEVICE RATING (AMPS/POLE) 20/1	25/2	30/1	30/2	40/1	40/2	50/1	50/2	DISCONNECTING DEVICE AT UNIT (AMPS/POLE) FUSTAT	30/1	30/2	30/3	60/1	60/2	60/3	SIZE FUSE	NEMA/SR	STARTER (SIZE/POLE) 0/3	1/3	2/3	IN MCC	AT UNIT	NEMA/SR	CIRCUIT NUMBER	FEEDER IDENT.
F-1	●		1/2			●									T														LB-16	20.2
CU-1		●			17		●									SW					25A	●							◇3	30.2
RTH-1	●				5	●									T														LB-22	20.2
GUH-1	●		0.1			●									T														LB-24	20.2
GUH-2	●		0.1			●									T														LB-24	20.2
GUH-3	●		0.1			●									T														LB-26	20.2
GUH-4	●		0.1			●									T														LB-26	20.2
②EF-1	●		3/4			●									T														LB-28	20.2
①EF-2	●		FRAC			●									T														LB-1	20.2
①EF-3	●		FRAC			●									T														LB-1	20.2
②EF-4	●		1/4			●									T														LB-30	20.2
EWH-1		●		18.75			●									⑥													◇4	30.2
RCP-1	●		1/6			●									T														◇5	20.2

EQUIPMENT CONNECTION SCHEDULE NOTES

ICE

GENERAL NOTES:

a. ALL CONNECTIONS AND ELECTRICAL EQUIPMENT LISTED IN THIS SCHEDULE SHALL BE PROVIDED AND INSTALLED BY THE ELECTRICAL CONTRACTOR

b. REFER TO THE MECHANICAL DRAWINGS AND SPECIFICATIONS FOR THE REQUIREMENTS ASSOCIATED WITH WIRING AND CONNECTIONS OF INTERLOCKING, THERMOSTAT LOCATIONS, EXHAUST FAN CONTROL SWITCHES AND OTHER CONTROLS OF MECHANICAL EQUIPMENT.

SCHEDULE NOTES:

① EXHAUST FAN SHALL BE SWITCHED WITH LIGHT FIXTURES. PROVIDE WITH MOTOR RATED TOGGLE SWITCH. COORDINATE ALL REQUIREMENTS WITH THE MECHANICAL CONTRACTOR.

② EXHAUST FAN SHALL BE CONTROLLED BY A MOTOR RATED PILOT SWITCH AND SHALL BE INTERLOCKED WITH MOTORIZED DAMPERS. REFER TO THE MECHANICAL SHEETS FOR THE SWITCH LOCATION. COORDINATE ALL REQUIREMENTS WITH THE MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.

③ CONNECT CONDENSING UNITS TO NEXT AVAILABLE 30A/2P SPARE CIRCUIT BREAKER IN EXISTING PANEL 'LA'. PROVIDE NEW 30A/2P CIRCUIT BREAKER AS REQUIRED.

④ CONNECT ELECTRIC WATER HEATER TO NEXT AVAILABLE 25A/2P SPARE CIRCUIT BREAKER IN EXISTING PANEL 'LA'. PROVIDE NEW 25A/2P CIRCUIT BREAKER AS REQUIRED

⑤ CONNECT RE-CIRCULATING PUMP UNIT TO NEXT AVAILABLE 20A/1P SPARE CIRCUIT BREAKER IN EXISTING PANEL 'LA'. PROVIDE NEW 20A/1P CIRCUIT BREAKER AS REQUIRED.

⑥ PROVIDE CIRCUIT BREAKER SERVING INSTANTANEOUS ELECTRIC WATER HEATER WITH PERMANENT PROVISIONS FOR LOCKING CIRCUIT BREAKER IN THE OPEN POSITION IN ACCORDANCE WITH 2020 NEC SECTION 110.25.

LIGHT FIXTURE SCHEDULE

ICE

FIXT LTR	MANUFACTURER	CATALOG NUMBER	LAMPS WATTAGE	LAMPS TEMP	LAMPS LUMENS	FIXT. VOLT.	FINISH	MOUNTING	REMARKS
A	ILP LIGHTING	DSC8-20L-HE-U-40-FCLGR	143W	4,000K	20,228	120V	STD	SUSPENDED	4' SUSPENDED STRIP ◇1
B	ILP LIGHTING	WTZ8-14L-U-40-SAFL	103W	4,000K	14,245	120V	STD	WALL	4' WALL MOUNTED STRIP
C	ILP LIGHTING	PAN24-36WLED-U-40	36W	4,000K	4,553	120V	STD	RECESSED	2'X4' RECESSED PANEL
D	ILP LIGHTING	OWM-3L/5L-U-CCTS-BRZ-EM10	39W	4,000K	5,294	120V	BRONZE	WALL	WALL PACK
E	MULE	SQ-80-LED-W-HL	-	-	-	120V	STD	SURFACE	EMERGENCY LIGHT ◇2
F	ILP LIGHTING	OWL-13L-U-CCTS-BRZ	98W	4,000K	13,000	120V	BRONZE	WALL	WALL PACK
XA	MULE	SQC-LED-U-R-WW-HL	-	-	-	120V	STD	SURFACE	COMBO EMERG EXIT ◇2
XB	MULE	HLCWLEZU-1-R-6-12-G-CW	-	-	-	120V	STD	SURFACE	COMBO EMERG EXIT ◇2

LIGHT FIXTURE SCHEDULE NOTES

ICE

GENERAL NOTES:

a. GENERAL CONTRACTOR SHALL PROVIDE FIREPROOFING AROUND RECESSED FIXTURES INSTALLED IN FIRE RATED CEILING PER U.L. REQUIREMENTS. ELECTRICAL CONTRACTOR SHALL COORDINATE.

b. SEE SPECIFICATIONS FOR LAMP AND BALLAST TYPE. VERIFY LAMP COLOR WITH ARCHITECT PRIOR TO ORDERING.

c. PROVIDE ARROWS AND FACES AS INDICATED BY THE DRAWINGS.

d. MANUFACTURERS LISTED IN THIS SCHEDULE OR BY WRITTEN ADDENDUM WILL BE THE ONLY APPROVED MANUFACTURERS TO BID THE LIGHTING FIXTURES FOR THIS PROJECT. CONTRACTORS AND SUPPLIERS USING PRICING FROM MANUFACTURERS NOT LISTED ON SCHEDULE OR BY ADDENDUM DO SO AT THEIR OWN RISK.

e. ALTERNATE LIGHT FIXTURE PACKAGES SHALL BE CONSIDERED FOR APPROVAL PENDING THE FOLLOWING INFORMATION IS PROVIDED TO THE ENGINEER OF RECORD SIX BUSINESS DAYS PRIOR TO THE PROJECT BIDDING:
- FIXTURE CUT SHEETS FOR ALL PROPOSED EQUAL FIXTURES. THE CUT SHEETS SHALL HAVE THE SPECIFIC MODEL NUMBER INDICATED ON EACH INDIVIDUAL CUT SHEET
- PROVIDE A COVER PAGE WITH ALL FIXTURE MODEL NUMBERS LISTED
- THE COVER PAGE AND ALL INDIVIDUAL FIXTURE CUT SHEETS SHALL BE COMBINED INTO A SINGLE PDF.

PACKAGES THAT ARE SUBMITTED THAT DO NOT MEET THE CRITERIA ABOVE WILL NOT BE REVIEWED FOR APPROVAL.

f. EC TO PROVIDE ALL LOW VOLTAGE WIRING FOR 0-10V DIMMABLE FIXTURES. PROVIDE PINK AND PURPLE PAIR OF WIRES TO CONNECT LUMINAIRES, DRIVERS AND DEVICES.

LIGHT FIXTURE SCHEDULE NOTES:

◇1 FIXTURE SHALL BE SUSPENDED FROM STRUCTURE. CONTRACTOR SHALL PROVIDE ALL MOUNTING HARDWARE AS REQUIRED. FIXTURE SHALL BE SUSPENDED SO THAT BOTTOM OF FIXTURE IS EVEN WITH STRUCTURAL PURLIN.

◇2 PROVIDE BACK UP BATTERY FOR 90 MINUTE EMERGENCY OPERATION AS REQUIRED.

SPECIAL OUTLET SCHEDULE

ICE

SYMBOL	DESCRIPTION
ⓐA	THE ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL A GFCI DEAD FRONT DEVICE AHEAD OF THE RECEPTACLE FEEDING A PIECE OF EQUIPMENT. THE DEAD FRONT DEVICE SHALL BE EQUAL TO HUBBELL GFBFST20. VERIFY THE FINISH WITH THE ARCHITECT PRIOR TO ORDERING.
ⓐB	PROVIDE NEMA 6-50R RECEPTACLE FOR OWNER PROVIDED EQUIPMENT. CONTRACTOR SHALL COORDINATE EXACT PLUG CONFIGURATION WITH OWNER PRIOR TO ROUGH IN.

CU FEEDER SCHEDULE

ICE

FEEDER IDENT.	CONDUCTORS SETS	CONDUCTORS QUANT. PER SET	CONDUCTORS SIZE	GROUND SIZE PER SET	ISOLATED GRD. SIZE PER SET	CONDUIT SIZE PER SET
20.X	1	SEE NOTE 'b'	#12	#12	-----	1/2"
30.X	1	SEE NOTE 'b'	#10	#10	-----	1/2"
40.X	1	SEE NOTE 'b'	#8	#10	-----	3/4"
50.X	1	SEE NOTE 'b'	#6	#10	-----	1"
60.X	1	SEE NOTE 'b'	#4	#10	-----	1 1/4"
70.X	1	SEE NOTE 'b'	#4	#8	-----	1 1/4"
80.X	1	SEE NOTE 'b'	#3	#8	-----	1 1/4"
90.X	1	SEE NOTE 'b'	#2	#8	-----	1 1/4"
100.X	1	SEE NOTE 'b'	#1	#8	-----	1 1/2"
150.X	1	SEE NOTE 'b'	#1/0	#6	-----	2"
200.X	1	SEE NOTE 'b'	#3/0	#6	-----	2"
225.X	1	SEE NOTE 'b'	#4/0	#4	-----	2-1/2"
250.X	1	SEE NOTE 'b'	#250 KCMIL	#4	-----	2-1/2"
300.X	1	SEE NOTE 'b'	#350 KCMIL	#4	-----	3"
400.X	1	SEE NOTE 'b'	#500 KCMIL	#3	-----	3-1/2"
450.X	2	SEE NOTE 'b'	#4/0	#2	-----	2-1/2"
500.X	2	SEE NOTE 'b'	#250 KCMIL	#2	-----	2-1/2"
600.X	2	SEE NOTE 'b'	#350 KCMIL	#1	-----	3"
800.X	2	SEE NOTE 'b'	#500 KCMIL	#1/0	-----	3-1/2"
1200.X	4	SEE NOTE 'b'	#350 KCMIL	#3/0	-----	3"
1600.X	5	SEE NOTE 'b'	#400 KCMIL	#4/0	-----	3-1/2"

FEEDER SCHEDULE NOTES:

a. THIS PROJECT MAY NOT REQUIRE ALL FEEDER TYPES LISTED IN THIS SCHEDULE.

b. THE NUMBER OF CONDUCTORS WILL BE BASED ON THE FOLLOWING NOTATION AT THE END OF EACH FEEDER TAG:

EXAMPLE: ,XXXX.X,

AMPACITY

XXXX.XS: INDICATES THE SERVICE FEEDER SIZE, AND NUMBER OF CONDUCTORS. NO GROUND SHALL BE REQUIRED FOR SERVICE FEEDERS.

XXXX.2: INDICATES (2) HOT CONDUCTORS (OR 1 HOT + 1 NEUTRAL) FOR SINGLE PHASE CONNECTIONS

XXXX.3: INDICATES (3) HOT CONDUCTORS FOR THREE PHASE CONNECTIONS,(OR 2 HOT +1 NEUTRAL) FOR SINGLE PHASE CONNECTIONS

XXXX.4: INDICATES (3) HOT CONDUCTORS & (1) NEUTRAL CONDUCTOR. FOR THREE PHASE CONNECTIONS

SYMBOL LIST

ICE

SYMBOL	DESCRIPTION	MOUNTING
(A)	LED FIXTURE & FIXTURE LETTER	CEILING
A	LED FIXTURE & FIXTURE LETTER	CEILING
(A) (A)	LED FIXTURE & FIXT. LETTER	SURF./RECESSED
A	LED FIXTURE & FIXT. LETTER	WALLBRACKET
E	EXIT FIXT. - SHADING DENOTES FACE(S)	CEIL./WALL
(E)	EMERGENCY LIGHT	CEIL./WALL
	GFCI DUPLEX GROUNDED RECEPTACLE	1'-6" AFF
	DUPLEX GROUNDED RECEPTACLE	1'-6" AFF
	EXTERIOR GFCI RECEPT. WEATHERPROOF	1'-6" AFF
	DOUBLE DUPLEX RECEPTACLE	1'-6" AFF
	SPECIAL OUTLET, SEE SCHEDULE OR AS NOTED	
	OCCUPANCY SENSOR. SEE SCHEDULE OR AS NOTED	
	PHONE/DATA OUTLET	1'-6" AFF
	DATA OUTLET	1'-6" AFF
	CATV OUTLET	1'-6" AFF
	SWITCHED RECEPTACLE	1'-6" AFF
W	TELEPHONE OUTLET (W= 44")	1'-6" AFF
$ $3 $4 $D $X $P	SWITCHES (1-POLE,3-WAY,4-WAY,DIMMER,KEY,PILOT)	4'-0" TO TOP
	PUSH BUTTON	
J	JUNCTION BOX	
A	BRANCH CIRCUIT PANEL & PANEL DESIG.	6'-6"TO TOP
30/3/240	H.D. SAFETY SWITCH (AMPS,POLE,VOLTAGE)	6'-6"TO TOP
0/3/240	STARTER (SIZE,POLE,VOLTAGE)	6'-6"TO TOP
X	PLAN NOTE	
	MOTOR	
	CONDUIT RUN W/ CONDUCTORS SEE NOTE #7	CEIL./WALL
	CONDUIT RUN 2 CIRCUIT, SEE NOTE #7	EARTH/FLOOR
	PARTIAL HOMERUN (MULTIPLE LOAD LOCATIONS)	
30.3 30/3	FEEDER 30.3 30A CIRCUIT SEE NOTE #7	
	CIRCUIT SUPPLIED FROM EMERGENCY SYSTEM	
XXX X	FEEDER IDENTIFICATION, SEE SCHEDULE	
CM	CEILING MOUNT	
CT	SEE NOTE #9	
WP	WEATHERPROOF	
EM	ITEM SUPPLIED FROM EMERGENCY SYSTEM	
a,b,c	INDICATES SWITCHING SCHEME	
TP	TAMPER PROOF	

GENERAL NOTES

ICE

1. VERIFY ALL OUTLET LOCATIONS ON THE JOB PRIOR TO ROUGH-IN.
2. REFER TO RELATED ARCHITECTURAL, MECHANICAL, AND STRUCTURAL DRAWINGS FOR RELATED INFORMATION.
3. REFER TO THE SPECIFICATIONS FOR DATA NOT ON THE DRAWINGS.
4. COORDINATE OUTLET BOX LOCATIONS WITH MASONRY TO MINIMIZE CUTTING OF BRICK OR BLOCK.
5. WALL MOUNTING HEIGHTS TO CENTERLINE OF DEVICE UNLESS OTHERWISE NOTED.
6. E.C. SHALL REFER TO MECHANICAL DRAWINGS AND SPECIFICATIONS FOR THE REQUIREMENTS ASSOCIATED WITH WIRING AND CONNECTION OF INTERLOCKING AND CONTROLS OF MECHANICAL UNITS AND THERMOSTAT LOCATIONS.
7. CONDUIT RUN W/CONDUCTORS AS INDICATED, CONDUIT SIZE AS REQUIRED. CONDUIT RUN TO PANEL DEVICE SIZE AS INDICATED (AMP/ POLE). CIRCUIT WITHOUT INDICATION IS ROUTED TO 20A, 1P. BREAKER. CONDUCTOR COUNT IS NOT SHOWN ON THE DRAWINGS FOR #12 SIZE CONDUCTORS. ELECTRICAL CONTRACTOR SHALL PROVIDE NUMBER OF CONDUCTORS AS REQUIRED FOR CIRCUITING, SWITCHING AND/OR CONTROL AS REQUIRED. ALL REQUIREMENTS OF THE CURRENT NATIONAL ELECTRICAL CODE SHALL BE FOLLOWED FOR CONDUIT FILL AND CONDUCTOR DE-RATING IF APPLICABLE.
8. EXIT LIGHTS AND EMERGENCY LIGHT FIXTURES WITH BATTERY BACKUP SHALL BE CIRCUITED WITH UNSWITCHED HOT CONDUCTOR FROM AREA LIGHTING CIRCUIT FOR POWER SENSING AND CHARGING. IN ADDITION, PROVIDE SWITCHED CIRCUITS TO ANY REQUIRED EMERGENCY LIGHT FIXTURES REQUIRING SAME FOR LOCAL AREA CONTROL.
9. "CT" INDICATED ADJACENT TO DEVICE INDICATES DEVICE IS MOUNTED ABOVE BACKSPLASH OF COUNTER TOP. VERIFY EXACT HEIGHT WITH ARCHITECTURAL PLANS AND ELEVATIONS.
10. A GROUND CONDUCTOR SIZED PER N. E. C. ARTICLE 250 IS REQUIRED IN ALL POWER, RECEPTACLE, AND LIGHTING CIRCUITS. GROUND CONDUCTORS ARE NOT SHOWN ON DRAWINGS.
11. WHERE AREA SMOKE DETECTORS ARE SHOWN ON THE DRAWINGS ELECTRICAL CONTRACTOR SHALL NOT LOCATE SMOKE DETECTORS CLOSER THAN 4 FEET FROM ANY MECHANICAL AIR SUPPLY OR RETURN DIFFUSER, GRILLE, OR REGISTER PER NFPA. ELECTRICAL CONTRACTOR SHALL COORDINATE WITH OTHER TRADES FOR LOCATION OF DETECTOR.
12. AT EVERY SMOKE OR FIRE/SMOKE DAMPER ELECTRICAL CONTRACTOR SHALL INSTALL A DUCT SMOKE DETECTOR AND RELAY TO CLOSE DAMPER AND SHUT DOWN ASSOCIATED MECH UNIT ON ACTIVATION OF DETECTOR. REFER TO MECHANICAL PLANS AND SPECIFICATIONS AND/OR MECHANICAL CONTRACTOR FOR LOCATIONS AND CONTROL REQUIREMENTS. PROVIDE 120V. CONTROL POWER AT DAMPER IF REQUIRED. IF REQUIRED BY THE FIRE ALARM SYSTEM SUPPLIER, MECHANICAL CONTRACTOR SHALL MODIFY DUCTWORK WHERE FIRE/SMOKE DAMPERS ARE LOCATED AS REQUIRED TO INSTALL DUCT SMOKE DETECTORS IN THE DUCTWORK AT THE FIRE/SMOKE DAMPER LOCATIONS. NOT ALL SMOKE OR FIRE/SMOKE DAMPERS MAY BE SHOWN ON THE DRAWINGS, HOWEVER, ALL SMOKE OR FIRE/SMOKE DAMPERS SHALL BE PROVIDED WITH ABOVE REQUIREMENTS.
13. THE ELECTRICAL CONTRACTOR SHALL PROVIDE A LABEL WITH THE AVAILABLE FAULT CURRENT AT THE SERVICE ENTRANCE EQUIPMENT. REFER TO THE SPECIFICATIONS FOR ADDITIONAL INFORMATION

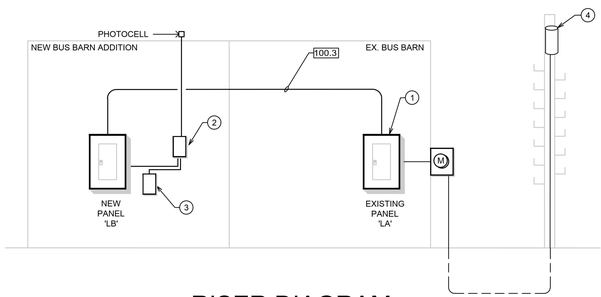
RISER NOTES:

① PROVIDE NEW 100A/2P CIRCUIT BREAKER AS REQUIRED TO FEED NEW PANEL 'LB'.

② PROVIDE 20A 4-POLE 120V LIGHTING CONTACTOR FOR CONTROL OF EXTERIOR LIGHTING. CONTACTOR SHALL HAVE INTERFACE WITH PHOTOCELL AND TIMECLOCK.

③ PROVIDE TIMECLOCK WITH PHOTOCELL INTERFACE FOR CONTROL OF EXTERIOR LIGHTS. TIMECLOCK SHALL INTERFACE WITH 4-POLE CONTACTOR VIA LOW VOLTAGE WIRING.

④ EXISTING SINGLE PHASE UTILITY TRANSFORMER SHALL REMAIN AS IS.



A RISER DIAGRAM

SCALE: N.T.S.
120/240V., 1Ø, 3W.

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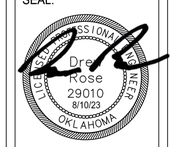
OKLAHOMA REGISTRATION NUMBER: 3662
23139.00-842

SEAL:



ICE JOB NUMBER - 23139.00 -842

HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

SHEET TITLE:
ELECTRICAL SCHEDULES

DATE: 08-10-2023

SHEET NUMBER
E1.1

Date: Aug 07, 2023, 12:41pm User ID: drose File: M:\2023\23139.00 - 842 - Hennessey Schools Bus Barn Addition\Electrical Files\23139.00- E1.X.dwg

New Panel: LB

Load Type:
L= Lighting, R=Receptacle,
M=Motors,HO= Hotel
K=KitchenH=HVAC, MI= Misc

Voltage: 240V/120
Phase: Single
Wires: 3W + G
Enclousure: Type 1
Sections: One

A.I.C. Rating: 10000A
Mains Rating: 100A
Main Breaker Size: N/A
Panel Lugs: Main Lug Only
Mounting: Surface

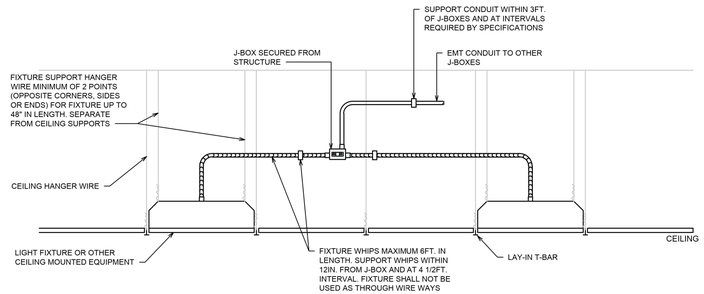
Circ No.	Load Description	Trip	Poles	Type	A		B		Type	Poles	Trip	Load Description	Circ No.
1	LTG - NORTHWEST	20	1	L	1458	1000			MI	1	20	RCPT- OVERHEAD DOOR	2
3	LTG - SOUTHWEST	20	1	L			1235	1000	MI	1	20	RCPT- OVERHEAD DOOR	4
5	RCPT - OVERHEAD DOOR	20	1	MI	1000	1000			MI	1	20	RCPT - OVERHEAD DOOR	6
7	RCPT - OVERHEAD DOOR	20	1	MI			1000	500	MI	1	20	RCPT - RM 109	8
9	RCPT - OFFICE 103	20	1	R	1080	500			MI	1	20	RCPT - RM 109	10
11	RCPT - RM 102	20	1	R			900	500	MI	1	20	RCPT - RM 109	12
13	RCPT - RM 102	20	1	R	180	500			MI	1	20	RCPT - RM 109	14
15	RCPT - RM 102	20	1	R			180	1000	H	1	20	F-1	16
17	RCPT - FRIDGE	20	1	R	500				H	1	20	SPARE	18
19	RCPT - RM 106	20	1	R			720		H	1	20	SPARE	20
21	RCPT - RM 106 & 107	20	1	R	900	600			MI	1	20	RTH-1	22
23	RCPT - WELDER	20	1	R			500	200	MI	1	20	GUH-1 & GUH-2	24
25	RCPT - WELDER	20	1	R	500	200			MI	1	20	GUH-3 & GUH-4	26
27	RCPT - RM 107	20	1	R			720	1000	MI	1	20	EF-1	28
29	RCPT - RM 107	20	1	R	360	500			MI	1	20	EF-4	30
31	RCPT - RM 106	20	1	R			720		MI	1	20	SPARE	32
*33	EXTERIOR LIGHTING	20	1	L	500				MI	1	20	SPARE	34
*35	EXTERIOR LIGHTING	20	1	L			750		MI	1	20	SPARE	36
37	SPARE	20	1	MI					MI	1	20	SPARE	38
39	SPARE	20	1	MI					MI	1	20	SPARE	40
41	SPARE	20	1	MI					MI	1	20	SPARE	42
43	SPARE	20	1	MI					MI	1	20	SPACE ONLY	44
45	SPARE	20	1	MI					MI	1	20	SPACE ONLY	46
47	SPARE	20	1	MI					MI	1	20	SPACE ONLY	48
49	SPARE	20	1	MI					MI	1	20	SPACE ONLY	50
51	SPARE	20	1	MI					MI	1	20	SPACE ONLY	52
53	SPARE	20	1	MI					MI	1	20	SPACE ONLY	54
a - Arc Fault Breaker		Total (KVA)			10.778		10.925						
b- Shunt Trip Breaker		Total Connected (KVA):					21.70						
c - GFCI Breaker		Total Connected (Amps):					90.43						

Notes: *LIGHTS SHALL BE RUN THRU CONTACTOR AND TIMECLOCK AS REQUIRED.

Per NEC, Article 220 for Lighting and General Receptacle Loads

Load Summary

Load Classification	Connected Load (KVA)	Demand Factor	Demand(KVA)	Panel Totals
Lights	3.9	1.25 Continuous	4.9	
Receptacles	7.3	Per NEC Table 220.13	7.3	Total Demand (KVA): 22.7
Motors	0.0	Per NEC 220.14	0.0	Demand Amps: 94.54
Hotel	0.0	Per NEC Table 220.11	0.0	
Kitchen	0.0	Per NEC Table 220.20	0.0	
HVAC	1.0	Per NEC 220.15	1.0	
Misc	9.5	1.00	9.5	



A LAY-IN FIXTURE MOUNTING

SCALE: N.T.S.

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HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

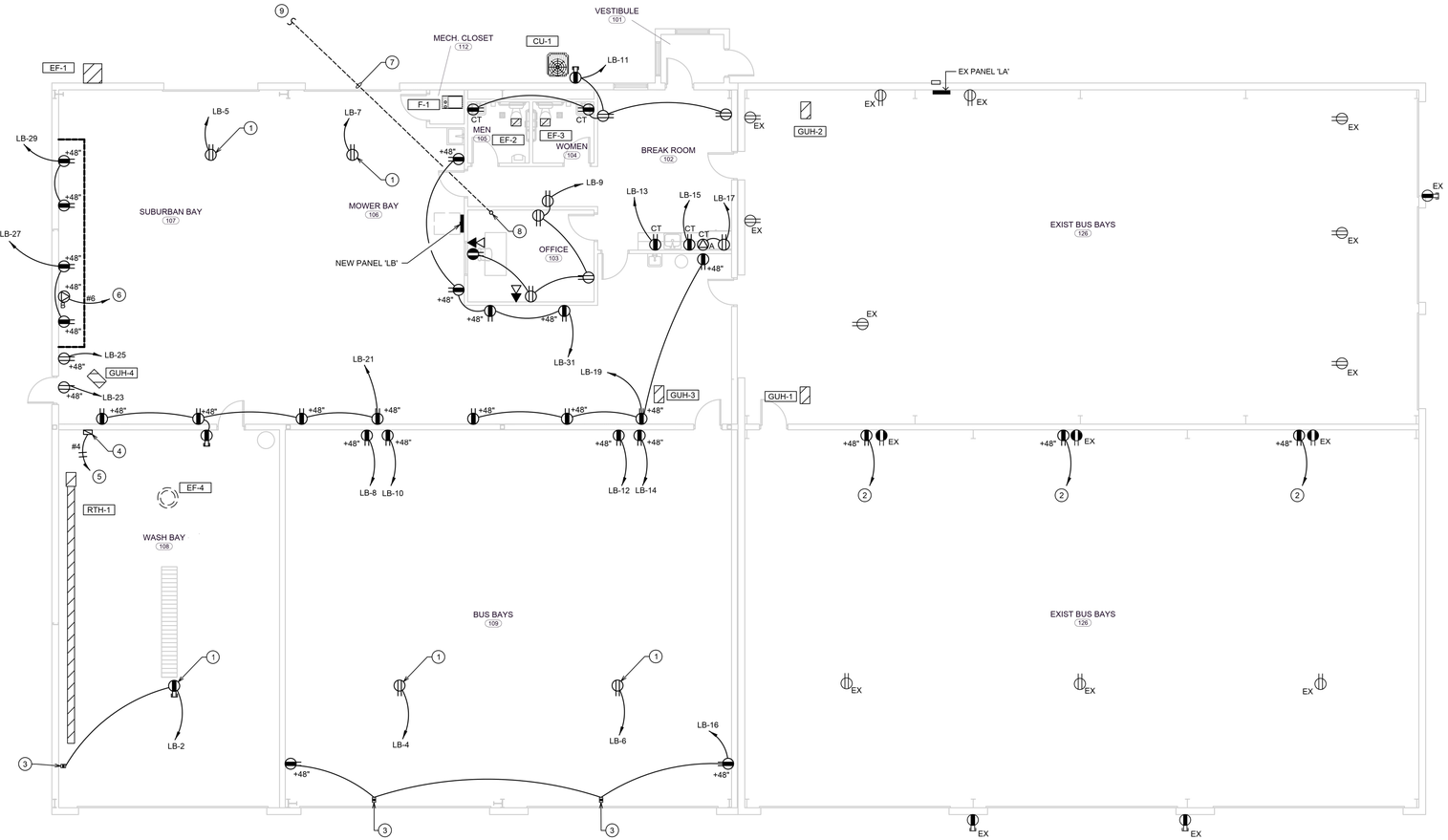
REVISIONS:
LABEL: DATE:

SHEET TITLE:
ELECTRICAL SCHEDULES

DATE: 08-10-2023

SHEET NUMBER
E1.2

Date: Aug 07, 2023, 12:42pm User ID: drose File: M:\2023\23139.00 - 842 - Hennessey Schools Bus Barn Addition\Electrical Files\23139.00- E1.X.dwg



A FLOOR PLAN - POWER

SCALE: 1/8" = 1'-0"

0 4' 8' 16'

NORTH

SCALE: 1/8" = 1'-0"

GENERAL NOTES:

1. ALL CIRCUITS INDICATED ON DRAWINGS SHALL BE 20A, 120V CIRCUITS WITH (2)-#12'S AND (1)-#12 G. IN 0.5" CONDUIT U.O.N.
2. LABEL ALL SNAP SWITCH COVERPLATES WITH THE PANEL AND CIRCUIT NUMBER.
3. REFER TO RELATED ARCHITECTURAL DRAWINGS FOR RELATED INFORMATION.
4. REFER TO THE SPECIFICATIONS FOR DATA NOT ON THE DRAWINGS.
5. WALL MOUNTING HEIGHTS TO CENTERLINE OF DEVICE UNLESS OTHERWISE NOTED.
6. A GROUND CONDUCTOR SIZED PER N.E.C. ARTICLE 250 IS REQUIRED IN ALL POWER, RECEPTACLE, AND LIGHTING CIRCUITS. GROUND CONDUCTORS ARE NOT SHOWN ON DRAWINGS.

PLAN NOTES:

(1) EC SHALL PROVIDE A RECEPTACLE MOUNTED TO THE BOTTOM OF STRUCTURE FOR POWER CONNECTION TO THE OVERHEAD DOOR. . COORDINATE ALL REQUIREMENTS AND BUTTON LOCATIONS WITH THE DOOR MANUFACTURER PRIOR TO ROUGH-IN.

(2) CONNECT TO EXISTING PANEL 'LA'. PROVIDE A NEW 120V, 20A BREAKER AS REQUIRED.

(3) EC SHALL PROVIDE A JUNCTION BOX FOR 120V POWER CONNECTION TO THE MOTORIZED DAMPER. COORDINATE ALL REQUIREMENTS WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.

(4) PROVIDE 60A 240V SINGLE PHASE DISCONNECT FOR POWER CONNECTION TO OWNER PROVIDED HOTSY WASH EQUIPMENT. CONTRACTOR SHALL COORDINATE EXACT ELECTRICAL REQUIREMENTS AS REQUIRED WITH OWNER PROVIDED HOTSY EQUIPMENT . CONTRACTOR SHALL REVISE FEEDER SIZE, CIRCUIT BREAKER SIZE, AND DISCONNECT SWITCH SIZE AS REQUIRED TO COORDINATE WITH OWNER PROVIDED HOTSY WASH EQUIPMENT.

(5) CONNECT TO NEXT AVAILABLE 60A/2P CIRCUIT IN EXISTING PANEL 'LA'. PROVIDE NEW 60A/2P CIRCUIT BREAKER AS REQUIRED.

(6) CONNECT TO NEXT AVAILABLE 50A/2P CIRCUIT IN EXISTING PANEL 'LA'. PROVIDE NEW 50A/2P CIRCUIT BREAKER AS REQUIRED.

(7) PROVIDE EMPTY 2" CONDUIT AND PULL STRING AS REQUIRED FOR FUTURE TELECOM CABLING. CONDUIT SHALL BE BURIED AT 36" BELOW GRADE MINIMUM. CONTRACTOR SHALL COORDINATE EXACT ROUTING OF CONDUIT WITH ALL EXISTING AND NEW UNDERGROUND UTILITIES.

(8) APPROXIMATE STUB UP LOCATION OF TELECOM CONDUIT INTO NEW ADDITION. CONTRACTOR SHALL COORDINATE EXACT STUB UP LOCATION WITH OWNER/ARCHITECT PRIOR TO ROUGH IN.

(9) NEW TELCOM CONDUIT SHALL BE ROUTED TO EXISTING TELEPHONE/FIBER OPTIC BOX LOCATED ON NORTHWEST CORNER OF SITE. REFER TO CIVIL PLANS FOR EACH LOCATION. CONTRACTOR SHALL COORDINATE EXACT ROUTING OF CONDUIT WITH ALL EXISTING AND NEW UNDERGROUND UTILITIES.

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HENNESSEY PUBLIC SCHOOLS
CAMPUS IMPROVEMENTS
BUS BARN RENOVATION AND SITE IMPROVEMENTS
HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

SHEET TITLE:
FLOOR PLAN - POWER

DATE: 08-10-2023

SHEET NUMBER
E2.1

Date: Aug 07, 2023, 12:44pm User ID: drose File: M:\2023\23139.00 - 842 - Hennessey Schools Bus Barn Addition\Electrical Files\23139.00- E2.X.dwg

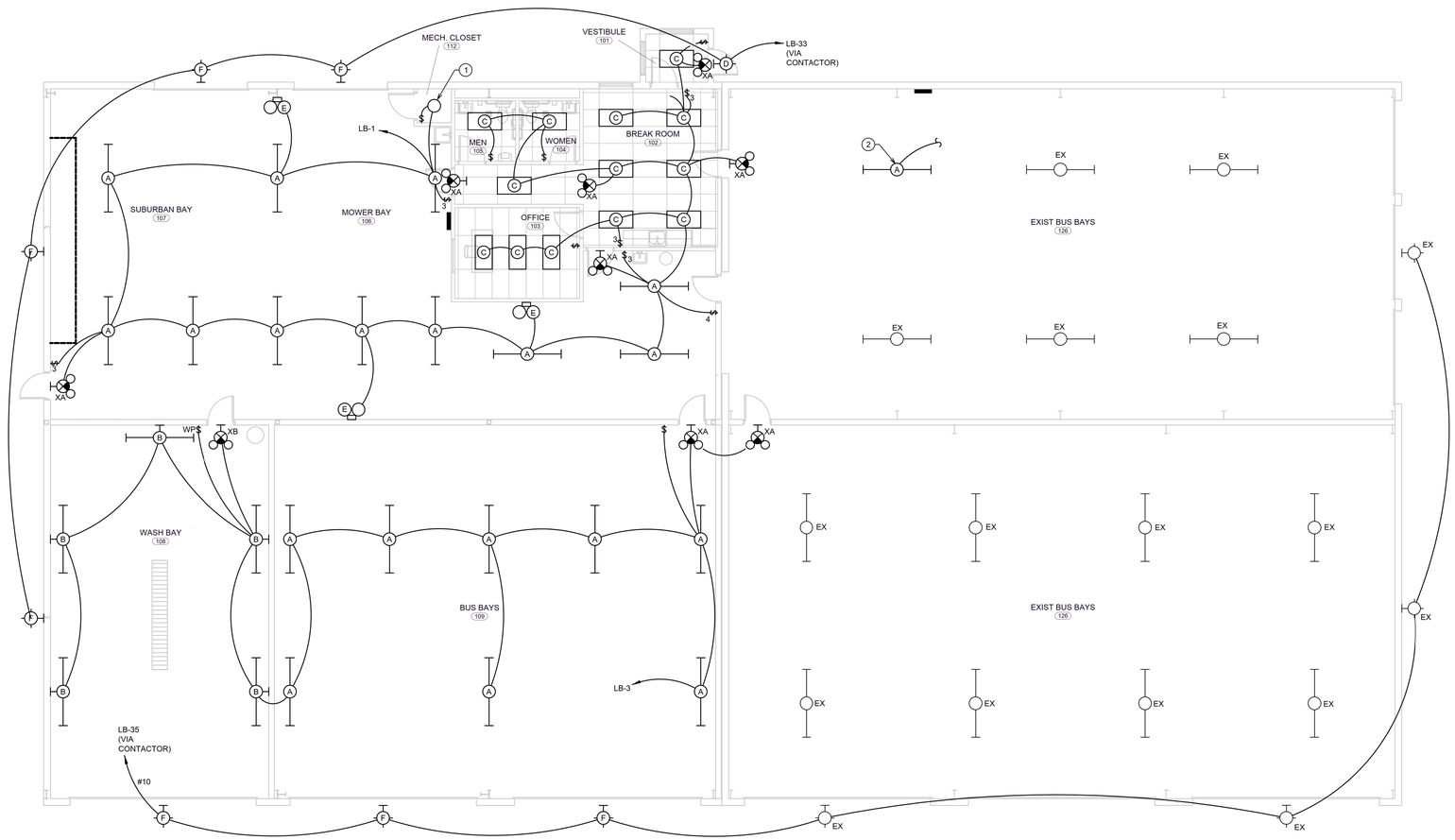
GENERAL NOTES:

1. ALL CIRCUITS INDICATED ON DRAWINGS SHALL BE 20A, 120V CIRCUITS WITH (2)-#12'S AND (1)-#12 G. IN 0.5" CONDUIT U.O.N.
2. LABEL ALL SNAP SWITCH COVERPLATES WITH THE PANEL AND CIRCUIT NUMBER.
3. REFER TO RELATED ARCHITECTURAL DRAWINGS FOR RELATED INFORMATION.
4. REFER TO THE SPECIFICATIONS FOR DATA NOT ON THE DRAWINGS.
5. WALL MOUNTING HEIGHTS TO CENTERLINE OF DEVICE UNLESS OTHERWISE NOTED.
6. A GROUND CONDUCTOR SIZED PER N.E.C. ARTICLE 250 IS REQUIRED IN ALL POWER, RECEPTACLE, AND LIGHTING CIRCUITS. GROUND CONDUCTORS ARE NOT SHOWN ON DRAWINGS.

PLAN NOTES:

(1) PROVIDE AND INSTALL A SURFACE MOUNTED PORCELAIN SOCKET. EC SHALL FURNISH AND INSTALL WITH A LED BULB WITH A MINIMUM 750 LUMENS.

(2) CONNECT TO NEAREST EXISTING 120V CIRCUIT LIGHTING CIRCUIT SERVING THIS ROOM.



A FLOOR PLAN - LIGHTING

SCALE: 1/8" = 1'-0"

0 4' 8' 16'

SCALE: 1/8" = 1'-0"

NORTH

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HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

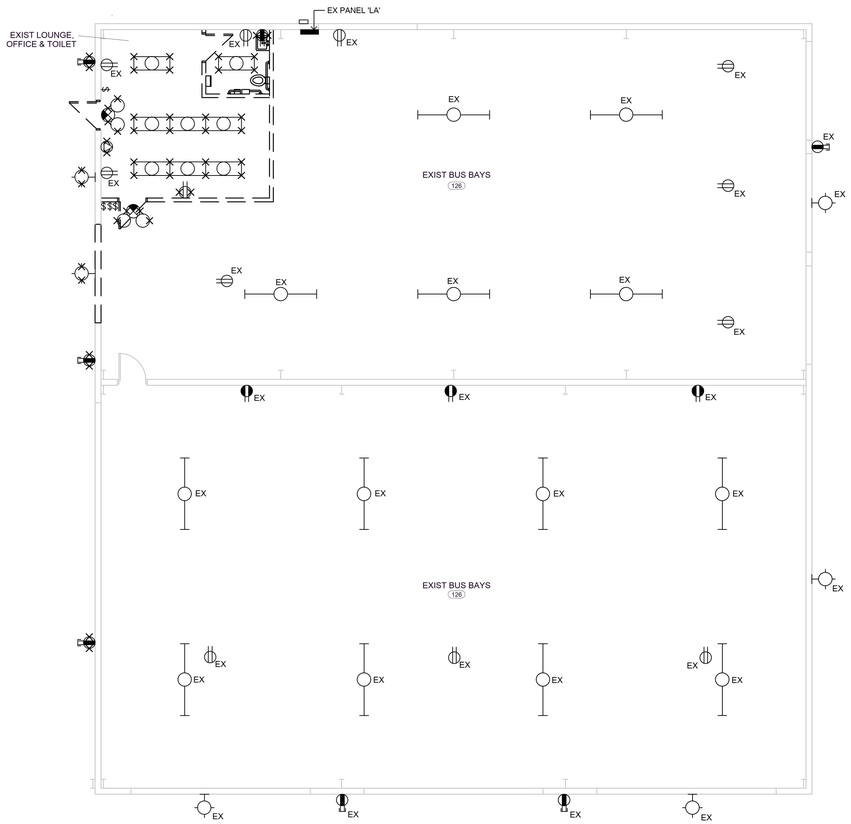
SHEET TITLE:
FLOOR PLAN - LIGHTING

DATE: 08-10-2023

SHEET NUMBER
E3.1

GENERAL NOTES:

1. REFER TO ARCHITECTURAL DEMO DRAWINGS FOR FURTHER INFORMATION.
2. FOR PURPOSES OF THE ELECTRICAL DEMO DRAWINGS, ELECTRICAL DEVICES LOCATED IN EXISTING WALLS THAT ARE TO REMAIN AS IS ARE SHOWN HERE ON THE DEMO DRAWINGS AND ARE NOTED TO BE EITHER REMAIN AS IS WITH AN 'EX' ADJACENT TO THEM. ELECTRICAL DEVICES NOTED TO BE REMOVED NOTED WITH AN 'X' OVER THE DEVICE. REMOVE THE ELECTRICAL DEVICE (RECEPTACLE OR DATA BOX) AND THEIR ASSOCIATED CONDUITS AND WIRING BACK TO THE POINT OF ORIGINATION. ENERGIZE ALL EXISTING DEVICES THAT WERE INTERRUPTED DURING DEMOLITION. WHERE ENTIRE CIRCUITS ARE REMOVED, TURN THE CIRCUIT BREAKER OFF AND LABEL AS 'SPARE'. WHERE EXISTING MECHANICAL EQUIPMENT IS REMOVED, ALL RELATED ELECTRICAL FEEDS TO THE EQUIPMENT THEIR ASSOCIATED CONDUITS BACK.



A FLOOR PLAN - ELECTRICAL DEMO

SCALE: 1/8" = 1'-0"

0 4' 8' 16'

NORTH

SCALE: 1/8" = 1'-0"

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HENNESSEY PUBLIC SCHOOLS
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HENNESSEY, OKLAHOMA

REVISIONS:
LABEL: DATE:

SHEET TITLE:
FLOOR PLAN - ELECTRICAL DEMO

DATE: 08-10-2023

SHEET NUMBER
ED2.1

Date: Aug 07, 2023, 12:43pm User ID: drose File: M:\2023\23139.00 - 842 - Hennessey Schools Bus Barn Addition\Electrical Files\23139.00- ED2.X.dwg

Project Manual

HENNESSEY PUBLIC SCHOOLS

2023 BUS BARN ADDITION

Hennessey, OK

August 10, 2023

SECTION 00 01 07 – SEALS PAGE

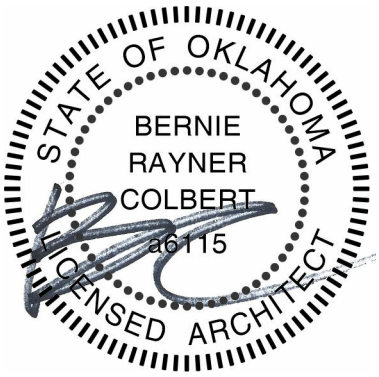
PROJECT:

Hennessey Public Schools
2023 BUS BARN ADDITION

ARCHITECT OF RECORD

Bernie Rayner Colbert, Architect
Renaissance Architecture, LLC
11100 Stratford Dr. Suite A-100
Oklahoma City, Ok 73120.7200

Architect's Stamp and Copyright for Architectural Sections: Divisions 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 12, 13, and 31 unless noted that they are prepared by consultants.
Refer to the Project Manual Index for sections.



08/11/2023

Bernie Rayner Colbert, Architect of Record

August 10, 2023
Date

Digitally signed by Bernic Colbert
Date: 2023.08.11 17:29:49-05'00'

HOLTZEN ENGINEERING GROUP

STRUCTURAL TECHNICAL SPECIFICATIONS

03 30 00 CAST-IN-PLACE CONCRETE

CIVIL TECHNICAL SPECIFICATIONS

31 10 00 SITE CLEARING

31 20 00 EARTH MOVING

33 10 00 WATER UTILITIES

Scott E. Holtzen, P.E.

SECTION 00 01 07 – SEALS PAGE

PROJECT:

Hennessey Public Schools
2023 BUS BARN ADDITION

ENGINEERS OF RECORD

Drew Rose, Electrical Engineer
Dwayne Vaughn, Mechanical Engineer
Integrated Consulting Engineers
349 S. Hydraulic
Wichita, KS 67211

Engineer's Stamp and Copyright for Engineering Sections: Divisions 22, 23, 26, and 27 unless noted that they are prepared by consultants.
Refer to the Project Manual Index for sections.

Drew Rose, Engineer of Record — August 10, 2023 Date

Dwayne Vaughn, Engineer of Record — August 10, 2023 Date

PROJECT MANUAL
TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING SERVICES REPORT

DIVISION 00 - BIDDING & CONTRACTING REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

ARCHITECT'S STAMP AND COPYRIGHT FOR DIVISIONS 01 THRU 32 DIVISIONS / SECTIONS OTHER THAN THOSE NOTED ARE PREPARED BY CONSULTANTS

DIVISION 02 – EXISTING CONDITIONS

DIVISION 03 – CONCRETE

DIVISION 04 – MASONRY – NOT USED

DIVISION 05 – METALS

DIVISION 06 - WOOD AND PLASTICS

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

DIVISION 08 - DOORS AND WINDOWS

END OF TABLE OF CONTENTS

SOLICITATION FOR BIDS

Separate Sealed Proposal will be received by Hennessey Public Schools at the location of:

Hennessey Administrative Conference Room
605 East Oklahoma
Hennessey, OK-73742

The 7th of September, 2023 at 12:00 P.M. for furnishing labor and materials for the new Bus Barn Addition and renovation project.

Said bid will be received at the Hennessey Public Schools by the superintendent of Schools. Immediately following the time stated above the bids will be publicly released at Hennessey Public Schools. Bids received more than ninety-six (96) hours, excluding Saturdays, Sundays, and holidays, before the time set for opening bids, as well as bids received after the time set for opening bids, will not be considered and will be returned unopened.
Contract Documents prepared by:

Renaissance Architecture
11100 Stratford Dr. Ste. A-100
Oklahoma City, OK 73120

Contract Documents will be on file at Southwest Construction News OKC, and ConstructConnect. Bidders may obtain complete sets of drawings and specifications by contacting the office of:

Renaissance Architecture
11100 Stratford Dr. Ste. A-100
Oklahoma City, OK 73120
405-749-4642

A cashiers check, certified check, or surety bond in the amount of (5%) of the bid shall accompany the submitted proposal of each bidder. The owner reserves the right to reject any or all bids.

Important new law (SB 1394) effective July 1, 1998
STATEMENT OF COMPLIANCE
Regarding Prohibition of Felony & Sex Offenders on School Premises

According to state law, a person or business contracting for services with a school or school district must sign a statement declaring that no employee working on school premises under the authority of such person or business is in violation of the provisions of this law. This statement of compliance must be signed and returned before payment(s) can be made. The undersigned person, of lawful age, states that this law will be observed.

STATE BILL 1394, Section 4:

A. No person or business having a contract with a school district for services to be performed during normal school hours shall allow any employee to work on school premises if such employee is convicted in this state, the United States, or another state of:
   1. Any sex offense subject to the Sex Offenders Registration Act in this state or subject to another state's or the Federal Sex Offender Registration provisions; or
   2. Any felony offense except as provided in subsection C of this section or when ten (10) years has elapsed since the date of the criminal conviction or the employee has received a presidential or gubernatorial pardon for the criminal offense.

B. Every person or business having a contract for services with a school district where such services are to be performed on the school premises during normal school hours shall be required to sign a statement declaring that no employee working on school premises under the authority of such person or business is in violation of the provisions of this section.

C. The provisions of this section shall not apply to volunteers, persons performing community service hours under court order or persons performing services under a supervised work release program. Provided, however, persons performing community service hours or services under work release shall not be allowed to work on school premises at any time after having been convicted of any offense stated in paragraph 1 of subsection A of this section
(70 O.S. Sec. 6-101.8).

Section 5:
It is unlawful for any person registered pursuant to the Sex Offenders Registration Act to work or provide services to children or to work on school premises, or for a person or business who offers or provides services to children or contract work to be performed on school premises to knowingly and willfully allow any employee to work with children or to work on school premises who is registered pursuant to the Sex Offenders Registration Act. Upon conviction for any of the provisions of this subsection, the violator shall be guilty of a misdemeanor punishable by a fine not to exceed One Thousand Dollars ($1,000.00). In addition, the violator may be liable for civil damages (57 O.S. Sec. 589),

VENDOR NAME (type or print) _____

AUTHORIZED REPRESENTATIVE _____

SIGNATURE _____

FEDERAL ID# OR SOCIAL SEC. 3 _____

DATE _____

TOBACCO FREE AFFIDAVIT

Bidder must sign an Affidavit as follows:

AFFIDAVIT AND DECLARATION OF BIDDER

COUNTY OF_____)
)
SS. STATE OF_____)

Affiant,_____, being first sworn upon oath, state:

1. That I am the_____ of _____
(title) (company)
(hereinafter "Bidder").

2. I declare that no employee working on the premises under the authority of the Bidder will be permitted to use tobacco products in Owner facilities and on Owner property. The Bidder and its sub-contractors and suppliers, their agents or employees, and any other persons performing any work on behalf of the Bidder, will not use tobacco products on Owner property.

3. The Bidder agrees to prominently display a Notice stating that Owner property is a tobacco-free site.

FURTHER AFFIANT SAYETH NOT.

DATED this___day of_____, 20___.

_____
Bidder or Authorized Agent

This instrument was acknowledged before me on the_____day of _____
_____, 20___.

_____
Notary Public

My Commission Expires/My Commission No.: _____

DRUG-FREE AFFIDAVIT

State of _____
ss.
County of_____

I _____, of lawful age, being first duly sworn, on oath says that _____ is the agent authorized by Contractor to submit the attached Drug-Free Affidavit to the Board of Education, in the District as stated below, and the County as stated below, in the State of Oklahoma. Affiant further states the following:

1. No employee working on premises under the authority of the contractor will be permitted to use a controlled substance at any time. The Contractor, sub-contractors and suppliers, their agents or employees and any other persons performing any work on behalf of the Contractor, will not be permitted to use a controlled substance at any time.

2. Contractor agrees to prominently display a Notice stating that school property is a drug-free site and that all persons entering school property are subject to random drug testing.

3. Contractor agrees to publish a statement notifying Contractor employees, sub-contractors and suppliers and their agents or employees that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition. Contractor agrees to provide all employees engaged in performance of the contract with a copy of the statement.

Project Name:_____ in the

District Number _____ in the

County of _____in the

State of Oklahoma.

_____
Signature

Subscribed and sworn to before this _____day of _____ 20____.

_____
Notary Public

My Commission Expires: _____, 20____.

INVOICE AFFIDAVIT/NON-KICKBACK STATEMENT
(Affidavit for Payment of Claim)

STATE OF _____)
) ss.
COUNTY OF _____)

The undersigned _____, of lawful age, being first duly sworn, on oath states: that this invoice or claim is true and correct; the work, services, or materials as shown by this invoice or claim have been completed or supplied in accordance with the plans, specifications, orders or requests furnished the claimant: that claimant has made no payment directly or indirectly to any elected official, officer, or employee of the Owner, Kingfisher County, Ok, of money or other thing of value to obtain payment of the invoice or procure the contract or purchase order pursuant to which an invoice is required.

_____
Affiant

NOTARY PUBLIC

Subscribed and sworn to before me this ___ day of _____, 20___.

_____
Notary

_____
My Commission Expires:

ACCORDING TO OKLAHOMA STATE LAW, ALL INVOICES OF $2,000 OR MORE FROM AN ARCHITECT, CONTRACTOR, ENGINEER OR SUPPLIER OF MATERIAL MUST HAVE THE ABOVE AFFIDAVIT SIGNED, NOTARIZED AND RETURNED BEFORE PAYMENT CAN BE PROCESSED

END OF SECTION

SECTION 00 21 13 - INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.01 BID FORMS

A. Bids shall be submitted on forms identical to the forms included in the Project Manual and in the quantity specified below. Seal proposals in an envelope and plainly mark the contents therein along with the name, address and phone number of the bidder.

1. Proposal: Proposal shall be authoritatively executed. Proposals carrying riders, alterations of construction time or qualifications which modify the amount of the Bid as submitted may be rejected as irregular. Incase of a difference between written words and figures in the Proposal, the amount stated in written words shall govern.
2. Bid Bond: Each bid shall be accompanied by a Bid Bond pledging that the Bidder will enter into a Contract with the Owner on the terms stated in his Bid and will furnish bonds as required for covering the faithful performance of the Contract and the payment of all obligations arising thereunder.
3. **Bid:** Sealed proposals will be received by the Hennessey Public Schools, **605 E Oklahoma St, by September 7, 2023, 12:00 PM.**

B. PROPOSAL PACKET:

1. Submit Proposal Packet, with a sealed outer envelope, labeled as follows:

BID DOCUMENTS

Project: **Bus Barn Addition & Renovation**
Hennessey Public Schools
Hennessey, Oklahoma

Bidder's Name:

2. Contents of Proposal packet:

a. Proposal (1 copy)
b. Bid Bond (1 copy)
c. Affidavits (1 copy) each
Non-Collusion Affidavit
Business Relationship Affidavit
Asbestos Awareness Notification
Statement of Compliance (Felony & Sex Offenders)
d. Worker’s Comp. Proof

1.02 CONDITIONS RELATING TO CONSTRUCTION

A. Bidders are required to inform themselves fully of conditions relating to construction and labor

under which the work will be performed. Contractor shall employ such methods and means in carrying out of this work as will not cause any interruption or interference with Owner's daily operations.

B. Examination of Premises: Before submitting proposal for this work, each bidder shall examine the premises, confirm all utility locations, sizes, pressures, etc., and satisfy himself as to existing conditions under which he will be obliged to operate. Bidders may remove portions of ceiling tile to inspect existing conditions.

1.03 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

A. Bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding Documents. Requests for clarification or interpretation of the Bidding Documents shall be made in writing by email or by telephone to:

Bernie Colbert
Renaissance Architecture, LLC
11100 Stratford Drive, Suite A-100
Oklahoma City, OK 73120
405-749-4642
bcolbert@renarch,com

B. Interpretations, corrections or changes of the Bidding Documents will be made by Addendum only. Information transmitted in any other manner will not be binding and Bidders shall not rely upon its accuracy.

C. Addenda are written or graphic instruments issued by the Architect before the execution of the Contract which modify or interpret the Bidding Documents by addition, deletion, clarification or correction. Addenda will be issued to each Bidder receiving a complete set of Bidding Documents. Each Bidder shall acknowledge receipt of addenda on the Proposal.

D. The Owner will not be responsible for any explanations or verbal interpretations of the Bidding Documents.

E. If documents illustrate scope of work in two different methods and no clarification is given to bidder, bidder is to price the higher of the two methods. rg

1.04 SUBSTITUTIONS

A. The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

B. No substitution will be considered before receipt of Bids unless written request for approval has been received by the Architect at least ten days before the date for receipt of Bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or other Work that incorporation of the substitute would require shall be included. The burden of proof of the merit of the proposed substitute is upon the proposer.

The Architect's decision of approval or disapproval of the proposed substitution shall be final.

C. If the Architect approves any proposed substitution before receipt of Bids, such approval will be set forth by Addenda. Bidders shall not rely upon approvals made in any other manner.

1.05 ADDITIONAL INFORMATION FOR BIDDERS

A. Contract: The Form of Agreement Between Owner and Contractor will be written on the Standard AIA Form, Document A101.

B. Bonds: Before execution of the Contract, the Bidder to whom the Contract is awarded will be required to furnish the following bonds:

1. Performance Bond - 100% of Contract Amount
2. Statutory Bond - 100% of Contract Amount
3. One Year Defect Bond - 100% of Contract Amount

Bonds shall be executed on forms identical to the form included in the Project Manual, Section 00600.

1.06 SOIL BORINGS AND SITE INVESTIGATION

A. Bidders shall visit site and acquaint themselves with site conditions before bidding. Bidders may make their own investigations to satisfy themselves with site and subsurface conditions. Fill all excavated areas at conclusion of investigation.

B. Soil boring information is attached.

END OF SECTION

SECTION 00 25 00 - BUSINESS RELATIONSHIP AFFIDAVIT

STATE OF OKLAHOMA

COUNTY OF

_____, of lawful age, being first duly sworn, on oath says that (s) he is the agent authorized by the bidder to submit the attached bid. Affiant further states that the nature of any partnership, joint venture, or other business relationship presently in effect or which existed within one (1) year prior to the date of this statement with the architect, engineer, or other party to the project is as follows:

Affiant further states that any such business relationship presently in effect or which existed within one (1) year prior to the date of this statement between any officer or director of the bidding company and any officer or director of the architectural or engineering firm or other party of the project is a follows:

Affiant further states that the names of all persons having any such business relationships and the positions they hold with their respective companies or firms are as follows:

(If none of the business relationships hereinabove mentioned exist, affiant should so state).

Subscribed and sworn to me this _____ Day of _____, 20____.

Notary Public

My commission expires:

Seal

DOCUMENT 00 26 00 - PROCUREMENT SUBSTITUTION PROCEDURES

1.1 DEFINITIONS

A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.

B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 01 25 00 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

1.2 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.3 PROCUREMENT SUBSTITUTIONS

A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.

B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:
   1. Extensive revisions to the Contract Documents are not required.
   2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
   3. The request is fully documented and properly submitted.

1.4 SUBMITTALS

A. Procurement Substitution Request: Submit to Architect through the Contractor. Procurement Substitution Request must be made in writing in compliance with the following requirements:
   1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
   2. Submittal Format: Submit digital copies of each written Procurement Substitution Request, using form bound in Project Manual.
      a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
      b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:
         1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
         2) Copies of current, independent third-party test data of salient product or system characteristics.

3) Samples where applicable or when requested by Architect.
4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from ICC-ES.
7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.

c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:
1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT

Section 00 40 00 - CONTRACTORS CHECKLIST FOR BID SUBMITTAL

The Oklahoma Public Competitive Act of 1974 requires the following items to be submitted at the bid opening in order to be qualified bid:

1. **Bid Form** – Signed
2. **Business Relationships Affidavit –** Signed and notarized
3. **Non-Collusion Bid Affidavit –** Signed and notarized
4. **Bid Guarantee** (five percent of bid proposal)

   A. Certified Check
   B. Cashier's Check
   C. Bid Bond
   D. Irrevocable Letter of Credit form a banking institution insured by F.D.I.C. or F.S.L.I.C. (State Law limits this to a maximum of $100,000 contracts.)

5. Acknowledge All Addendums on Bid Form

SECTION 00 41 00 - BID FORM

Date: August 10, 2023

Bus Barn Addition & Renovation
Hennessey Public Schools
Hennessey, Oklahoma

The undersigned, hereinafter referred to as the "Bidder" declares that before preparing his Bid he visited the site, familiarized himself with all factors affecting the cost of the Work and carefully examined the Drawings and Project Manual for the **Hennessey Public Schools** hereinafter referred to as the "Owner" as prepared by Renaissance Architecture, LLC.

BASE BID

Bidder hereby proposes to furnish all necessary labor, materials, tools and equipment, together with all other items of cost including insurance, and supervision, required for the work called for on the Drawings and in the Project Manual.

BASE BID sum of:

_____Dollars ($_____)

Project will be completed as follows:

_____ calendar days from notice to proceed.

Bidder further agrees that the certified check, cashier's check or bidder's bond payable to the Owner accompanying this proposal, is to be left in escrow with the Owner, that its' amount of five percent (5%) of the bid figure is the measure, or portion of the measure, of liquidated damages which the Owner will sustain by the failure of the Bidder to execute and deliver the above named Agreement, bonds, and insurance and that if the Bidder defaults in executing such Agreement within ten (10) days of written notification of the award of the Contract to him, or defaults in furnishing the bonds and insurance within said ten (10) days, the Bid Security, as set forth in Oklahoma State Statutes, Title 61, shall be due and payable to the Owner. If the proposal is not accepted within Thirty (30) days of the time set for the submission of bids, or if the Bidder executes and delivers said agreement, bonds, and insurance, the check or bidder's bond shall be returned to him.

ADDENDUM RECEIPT:
Bidder acknowledges receipt of the following addenda:

ADDENDUM NO._____dated
ADDENDUM NO._____dated
ADDENDUM NO._____dated
ADDENDUM NO._____dated

Respectfully submitted.

Bidder

By

Title

Bidder's Address:

_____Telephone

SECTION 00 45 19 - NONCOLLUSION AFFIDAVIT

STATE OF

COUNTY OF

_____, of lawful age, being first duly sworn, on oath says, that (s)he is the agent authorized by _____, the contractor herein, to submit the attached bid to the _____.

Affiant further states that the said contractor has not paid given or donated or agreed to pay, give or donate to any

officer or employee of the _____ any money or thing of value, either directly or indirectly, for special consideration in the letting of a contract.

Subscribed and sworn to me this _____ day of _____ , 20

Notary Public

My commission expires:

Seal

DOCUMENT 00 50 00

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned (1)_____
_____
as Principal, and (2)_____,
as Surety, are hereby held and firmly bound unto (3)_____
_____ as Owner,
in the penal sum of (4)_____for the
payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

Signed this _____ day of _____, 20_____.

The condition of the above obligation is such that whereas the Principal has submitted to (3) _____
a certain Bid, attached hereto and hereby made a part hereof into a Contract in writing,
for the (5) _____
_____.

NOW, THEREFORE,

(1) If said Bid shall be rejected, or in the alternate,

(2) If said Bid shall be accepted and the Principal shall execute and deliver a Contract in the Form of Contract attached hereto (properly completed and in accordance with said Bid) and shall furnish a bond for this faithful performance of said Contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by an extension of the time within which the Owner may accept such bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their proper officers, the day and year first set forth above.

(Seal)

_____
Principal (L.S.)

_____
Surety

By _____

(1) Name of Contractor
(2) Name of Surety
(3) Corporate name of Owner
(4) 5% Bid Amount
(5) Clear, Concise Description

DOCUMENT 00 52 00

STATUTORY BOND

KNOW ALL MEN BY THESE PRESENTS:

That (1)_____as Principal,

and

(2)_____ _____,

and

(3)_____ _____

organized under the laws of the State of_____and

authorized to transact business in the State of Oklahoma, as Surety, and held and firmly bound unto

(4)_____ _____

in the penal sum of

_____Dollars($_____)

in lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves and each of us, our heirs, executors, administrators, trustees, successors, and assigns, jointly and severally, firmly by these presents.

DATED this _____ day of _____, 20 _____.

The condition of this obligation is such that:

WHEREAS, said Principal entered into a written Contract with (4)

_____, dated

_____, 20 _____,

for (5) _____ all in compliance

with the Drawings and Specifications therefore, made a part of said Contract and on file in the office of (6) _____.

NOW, THEREFORE, if said Principal shall fail or neglect to pay all indebtedness incurred by said Principal or Subcontractors of said Principal who perform work in the performance of such Contract, for labor and materials and repairs to and parts for equipment used and consumed in the performance of said Contract within thirty (30) days after the same becomes due and payable, the person, firm or corporation entitled thereto may sue and recover this Bond, the amount so due and unpaid.

It is further expressly agreed and understood by the parties hereto that no changes or alterations in said Contract and no deviations from the plan or mode of procedure herein fixed shall have the effect of releasing the

sureties, or any of them, from the obligations of this Bond.

It is further and expressly agreed and understood by the parties hereto that no obligation shall exist or be made for notification to said sureties regarding the before mentioned changes, alterations, deviations or procedures.

IN WITNESS WHEREOF, the said Principal has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its duly authorized officers, and the said Surety has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by it Attorney-In Fact, duly authorized so to do, the day and year first above written.

ATTEST_____

_____
Principal

_____
Title

_____
Surety

_____
Attorney-In-Fact

(1) Contractor
(2) Name of Surety
(3) Corporation, partnership or Individual
(4) Owner
(5) Description of work
(6) Name and Address of Owner

DOCUMENT 00 53 00

WARRANTY BOND

KNOW ALL MEN BY THESE PRESENTS:

That (1)_____as

Principal, and

(2)_____ _____,

a

(3)_____ _____

organized under the laws of the State of_____and authorized to transact business in the State of Oklahoma, as Surety, and held and firmly bound unto

(4)_____ in

the penal sum of _____Dollars ($_____) in lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves and each of us, our heirs, executors, administrators, trustees, successors, and assigns, jointly and severally, firmly by these presents.

DATED this _____ day of _____, 20 _____.

The condition of this obligation is such that:

WHEREAS, said Principal entered into a written Contract with (4) _____, dated _____, 20 _____,for (5) _____ all in compliance with the Drawings and Specifications therefore, made a part of said Contract and on file in the office of (6) _____.

NOW, THEREFORE, if said Principal shall pay or cause to be paid to (4) _____

all damage, loss, and expense which may result by reason of defective materials and/or workmanship in connection with said work, occurring within a period of one (1) year from and after acceptance of said project by (4) _____ and if Principal shall pay or cause to be paid all labor and materials, including the prime contractor and all subcontractors; and if Principal shall save and hold (40 _____ harmless from all damages, loss, and expense occasioned by or resulting from any failure whatsoever of said Principal, then this obligation shall be null and void, otherwise to be and remain in full force and effect.

It is further expressly agreed and understood by the parties hereto that no changes or alterations in said Contract and no deviations from the plan or mode of procedure herein fixed shall have the effect of releasing the sureties, or any of them, from the obligations of this Bond.

It is further and expressly agreed and understood by the parties hereto that no obligation shall exist or be made for notification to said sureties regarding the before mentioned changes, alterations, deviations or procedures.

IN WITNESS WHEREOF, the said Principal has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its duly authorized officers, and the said Surety has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by it Attorney-In Fact, duly authorized so

to do, the day and year first above written.

ATTEST

_____
Principal

_____

_____
Title

_____
Surety

_____
Attorney-In-Fact

(1) Contractor
(2) Name of Surety
(3) Corporation, partnership or Individual
(4) Owner
(5) Description of work
(6) Name and Address of Owner

Document 00 54 00

CLAIM OR INVOICE AFFIDAVIT

STATE OF _____)

) SS

COUNTY OF _____)

The undersigned (Architect, Contractor, Trade Contractor, Supplier, Engineer, or Supervisory Official), of lawful age, being first duly sworn, on oath says that this (Invoice, Claim or Contract) is true and correct. Affiant further states that the (Work, Services, or Materials) as shown by this invoice or Claim have been (Completed or Supplied) in accordance with the Drawings, Specifications, Orders, or Requests furnished to the Affiant. Affiant further states that (s)he has made no payment, given, or donated or agreed to pay, give, or donate, either directly or indirectly; to any elected official, officer, or employee of the (1)_____ of money or any other thing or value to obtain payment or the award of this Contract.

_____

General Contractor

Subscribed and sworn to before me this _____day of _____, 20____.

_____

Notary Public

My Commission Expires: _____

(1) Owner

DOCUMENT 00 61 13.13

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That:

(1)_____as Principal,

and (2)_____, and

(3)_____

organized under the laws of the State of_____and authorized to transact business in the State of Oklahoma, as Surety, and held and firmly bound unto

(4)_____ in the penal sum

of _____Dollars ($_____) in lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves and each of us, our heirs, executors, administrators, trustees, successors, and assigns, jointly and severally, firmly by these presents.

DATED this _____ day of _____, 20 _____.

The condition of this obligation is such that:

WHEREAS, said Principal entered into a written Contract with
4)_____

_____, dated _____, 20___,

for (5) _____ all in compliance with the Drawings and Specifications therefore, made a part of said Contract and on file in the office of (4)

_____
(Name and address of Owner)

NOW, THEREFORE, if said Principal shall, in all particulars, well, truly, and faithfully perform and abide by said Contract and each and every covenant, condition and part thereof and shall fulfill all obligations resting upon said Principal by the terms of said Contract and said Specifications, and if said Principal shall promptly pay, or cause to be paid, all labor, materials and/or repairs and all bills for labor performed on said work, whether by subcontract or otherwise; and if said Principal shall protect and save harmless said (4) _____
from all loss, damage and expense to life or property suffered or sustained by any person, firm, or corporation caused by said Principal or his or its agents, or employees in the construction of said work, or by or in consequence of Any negligence, carelessness or misconduct in guarding and protecting the same, or from any act or omission of said Principal or his or its agents, servants, or employees, and if said Principal shall protect and save (4) _____
harmless from all suits and claims of infringement or alleged infringement or patent rights or processes, then this

obligation shall be null and void, otherwise to be and remain in full force and effect.

It is further expressly agreed and understood by the parties hereto that no changes or alterations in said Contract and no deviations from the plan or mode of procedure herein fixed shall have the effect of releasing the sureties, or any of them, from the obligations of this Bond.

It is further expressly agreed and understood by the parties hereto that no obligation shall exist or be made for notification to said sureties regarding the before mentioned changes, alterations, deviations or procedures.

IN WITNESS WHEREOF, the said Principal has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its duly authorized officers, and the said Surety has caused these presents to be executed in its name and its corporate seal to be hereunto affixed by its Attorney-In-Fact, duly authorized so to do, the day and year first above written.

_____ATTEST

_____Principal

By_____

_____
Surety

(1) Contractor
(2) Name of Surety
(3) Corporate, Partnership or Individual
(4) Owner
(5) Description of Project

_____
Attorney-In-Fact

Document 00 65 19.13

CONTRACTOR'S AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS

STATE OF _____)

) SS.

COUNTY OF _____)

(1)_____ , of lawful age, being first duly sworn, upon his oath, deposes and says: That this is the

(2)_____ of the

(3)_____,a Corporation/Partnership/Individual organized and existing under the laws of the State of _____; that he makes this Affidavit for and on behalf of said Corporation/Partnership/Individual named herein is the same that entered into an Agreement with the

(5)_____on the _____ day of _____, 20____, to (4)_____.

That the said Corporation/Partnership/Individual has completed the work set forth in said Agreement; and that in accordance with said Agreement, Affiant further says under oath that there are no existing claims, judgements or liens, outstanding for labor and/or materials furnished under said Agreement and that all persons, firms or corporations who have performed work or furnished materials under this Agreement have been fully paid. Further affiant sayeth not.

_____

Affiant

Subscribed and sworn to before me this____ day of _____, 20___.

My Commission Expires: _____ _____

Notary Public

(1) Affiant

(2) Office

(3) General Contractor

(4) Description of Work

(5) Owner

Document 00 65 19.19

CONSENT OF SURETY COMPANY TO FINAL PAYMENT
CERTIFICATE OF APPROVAL

The_____, Surety Company, hereby certifies through its constituted Attorney-in-Fact, _____, that it has seen the attached affidavit of (1) _____ made on behalf of (2)_____ , a Corporation/Partnership/Individual sworn to on the ____ day of _____, 20__, stating that there was no existing claims, judgments or liens outstanding against said Corporation/Partnership/Individual for labor and/or materials furnished under its Agreement with the (4)_____to (3)_____and that all persons, firms or corporations who have performed work or furnished materials under said Agreement have been fully paid; and furthermore, approved and becomes legally bound to said, (4) _____under the terms of its surety Bond Agreement with the Board, by virtue of the execution of said Affidavit without qualification, condition or exception. Further, it consents that the said (4) _____ shall make its final payment under the above mentioned Agreement to said corporation upon the showing of such affidavit.

_____

Surety Company

_____

Attorney-in-Fact

Dated this ___ day of _____, 20__. (SEAL)

(1) Affiant

(2) General Contractor

(3) Description of Work

(4) Owner

SECTION 00 72 00 - GENERAL CONDITIONS

The provisions of AIA Document A201, “GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION, 2017" shall apply to this project, except as hereinafter amended or altered in Section 00 72 00.

Copies of this AIA Document are available for review at the Architect’s Office.

SECTION 00 73 00 - SUPPLEMENTARY CONDITIONS

The following modify, change, delete from or add to the GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION. Where any Article, Paragraph, Subparagraph, or Clause is modified or deleted by these Supplementary General Conditions, the unaltered provisions of that Article, Paragraph, Subparagraph, or Clause shall remain in effect.

ARTICLE 3 - CONTRACTOR

Add the following Clauses to subparagraph 3.2.1:

3.2.1.1 Errors, inconsistencies or omissions discovered in the Contract Documents which are reported to the Architect before 10 days of bid date shall be corrected by addenda issued by the Architect. If Contractor does not notify Architect of any such conditions it will be assumed all items of work and materials have been included in his bid.

Add the following paragraph:

3.19.1 SITE MEASUREMENTS

3.19.1 The Contractor shall field verify measurements of existing conditions at the site and shall be responsible for their correctness. No extra charge or compensation will be allowed on account of difference between actual dimensions and the indicated on the drawings. Difference found shall be submitted to the Architect for consideration before proceeding with the work.

3.19.2 The Contractor shall furnish engineering and layout services necessary to provide required lines and grade for the proper execution of the work.

ARTICLE 4.1 - ARCHITECT

Add the following subparagraph:

4.1.1.1 The Architect is Renaissance Architecture, LLC

ARTICLE 5 - SUBCONTRACTORS

Add the following paragraph and subparagraphs:

5.5 SUBCONTRACTOR COOPERATION AND COORDINATION

5.5.1 Subcontractors shall examine all Drawings and Project Manual for all work, whether for their specific work or the work of others.

5.5.2 Subcontractors shall cooperate with each other, correcting and coordinating their work in such manner not to delay or interfere with work of others.

5.5.3 Each subcontractor shall report to the Contractor in writing, with a copy to the Architect, all delays or difficulties encountered in the installation of his work which might prevent its prompt and proper installation or make it unsuitable to connect or to receive his work or the work of others. Failure to report shall constitute acceptance of the work of others as fit for the proper receipt of his work.

ARTICLE 8 - TIME

Add the following paragraph:

8.4 **Liquidated Damages:** Owner and Contractor recognize that time is of the essence in this agreement, and the Owner will suffer loss if the work is not substantially complete within the time specified in Section 00 41 00 Bid Form, plus any extensions thereof allowed in accordance with Article 8 of the General Conditions. They also recognize the delays, expense (defined in article 6.5) and difficulties involved with the actual loss suffered by the Owner if the work is not substantially complete on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for expenses (but not as a penalty) Contractor shall pay Owner **$750.00 for each calendar day** that expires after the time specified in paragraph 2.1 for substantial completion until the work is substantially complete**.**

8.5 Liquidated Damages (defined): Liquidated Damages cover the expenses occurred because not being able to use the work as intended. These expenses include, but not limited to, rental of temporary space, additional staffing, additional maintenance and janitorial staffing, transportation expenses due to relocation of events or activities, and postponement of events or activities resulting in loss of revenue.

ARTICLE 9 - PAYMENTS AND COMPLETION

Delete subparagraph 9.3.1 in its entirety and substitute the following:

9.3.1 On or before the 25th day of each month, the Contractor shall submit to the Architect an itemized Application for Payment, Notarized, and corporate seal if applicable, supported by such data substantiating the Contractor's right to payment as the Owner or the Architect may require, and reflecting retainage, if any, as provided elsewhere in the Contract Documents.

.1 Withholding of retainage (5% of the amount earned to date.

Add the following clause 9.6.1.1 to 9.6.1:

9.6.1.1 The Owner shall make payment within thirty (30) calendar days after the Architect has issued a Certificate for Payment.

Add the following paragraph:

ARTICLE 11 - INSURANCE AND BONDS

Add the following clauses to 11.1.2:

11.1.2.1 The insurance required by subparagraph 11.1.1 shall be written for not less than the following limits of liability, or greater if required by law.

1. GENERAL LIABILITY, including the following:

a. Comprehensive Form
b. Premises - Operation
c. Explosion and Collapse Hazard: (X & C as applicable)
d. Underground Hazard (U as applicable)
e. Products/Completed Operations Hazard: (To be maintained for "ONE YEAR", commencing with the issuance of the final Certificate of Payment.)
f. Contractual Insurance: including specified provision Contractor's obligations under Paragraph 4.18 - indemnification.
g. Broad Form Property Damage:
h. Independent Contractors:
i. Personal Injury:

	Limits of General Liability	
	Each OCCURRENCE	Aggregate
Bodily Injury	$1,000,000	$2,000,000
Property Damage	$250,000	$250,000
Personal Injury	$1,000,000	

2. AUTOMOBILE LIABILITY, including the following:
a. Comprehensive Form:
b. Owned
c. Hired
d. Non-Owned

	Limits of Automobile Liability
	Each OCCURRENCE
Bodily Injury and Property Damage Combined	$1,000,000

3. WORKER"S COMPENSATION AND EMPLOYERS" LIABILITY

	Limits of Workers' Comp. & Emp. Liability
a. State	STATUTORY
b. Employer's Liability	$1,000,000 (each accident)

4. OTHER LIABILITY COVERAGE
   a. Aircraft liability (owned and non-owned) when applicable: $1,000,000 for one occupant including passenger hazard coverage
   b. Watercraft Liability (owned and non-owned) when applicable.
   c. Builder's Risk: "All Risk/Completed Value" type.

5. ADDITIONAL INSUREDS, AS THEIR INTERESTS MAY APPEAR.
   a. Owner: Hennessey Public Schools
   b. Architect: Renaissance Architecture, LLC

6. CANCELLATION PROVISION

   Should any of the above described policies be cancelled before the expiration date thereof, the issuing company will mail 30 days written notice to the Owner and Architect.

11.4 PERFORMANCE BOND AND PAYMENT BOND

Delete paragraph 11.5 in its entirety and substitute the following:

11.4 BONDS

11.4.1 The Contractor shall provide Five (3) duplicate originals, complete with power-of-attorney attached showing the authority of the executing agent of the following bonds in such form as directed by the Owner, with surety being a duly authorized surety company satisfactory to the Owner and licensed to do business in Oklahoma:

.1 Performance Bond: Written in an amount equal to one hundred (100%) percent of the Contract price and issued in favor of the Owner.

.2 Defect (Materials and Workmanship) Bond: Written in an amount equal to one hundred (100%) percent of the contract price, to protect the Owner against defective workmanship and materials for a period of two (2) years after final acceptance of the project.

END OF DOCUMENT

SECTION 00 81 00 - CERTIFICATE OF COMPLIANCE WITH ASBESTOS RESTRICTIONS

Name of Owner: _____

Project Name: _____

To Whom It May Concern:

As a Contractor or Material Supplier for the above referenced project, we do certify and attest that no building materials or products were knowingly incorporated or installed in this project that contained more than one percent (1%) asbestos by weight, within the meaning of Public Law 99- 519 together with the United States Environmental Protection Agency Regulations, Section 763.83 promulgated October 30, 1987, Federal Register, Volume 52, No. 210 defining Asbestos Containing Building Material (ACBM).

We also certify and attest that this Certification of Compliance with Asbestos Restrictions was included in each and every Subcontract and purchase order connected with the performance of Work for this Project, with a copy signed by the Subcontractor or Material Supplier remaining in our Project Files for inspection.

Respectfully,

Name of Contractor: _____

Address of Contractor:

Street Address _____

City: _____ State: _____ Zip Code: _____

Signature: _____Date: _____

Print Name and Title: _____

Affiant:

Attest and Seal: _____

Subscribed and Sworn to Before me This _____ day of _____, 20_____.

Notary Public Signature: _____

Notary Public Print Name: _____

My Commission Expires: _____

END OF SECTION

SECTION 01 10 00 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Phased construction.
   4. Work performed by Owner.
   5. Work under Owner's separate contracts.
   6. Future work not part of this Project.
   7. Owner's product purchase contracts.
   8. Owner-furnished/Contractor-installed (OFCI) products.
   9. Owner-furnished/Owner-installed (OFOI) products.
   10. Contractor-furnished/Owner-installed (CFOI) products.
   11. Contractor's use of site and premises.
   12. Coordination with occupants.
   13. Work restrictions.
   14. Specification and Drawing conventions.
   15. Miscellaneous provisions.

B. Related Requirements:
   1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

A. Project Identification: Hennessey Public Schools, Bus Barn Addition.
   1. Project Location: 604 E. Oklahoma St., Hennessey, OK 73742.

B. Owner: Hennessey Public Schools
   1. Owner's Representative: Jason Sternberger, Superintendent; phone 405-853-4321.

C. Architect: Renaissance Architecture. 11100 Stratford Drive, Suite A-100, Oklahoma City, Ok 73120. Phone; 405-749-4642 Ext. 114; e-mail bcolbert@renarch.com ; website: www.renaissancearchitecture.com .

D. Other Owner Consultants: Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:
   1. Civil: Holtzen Engineering Group, has prepared the following portions of the Contract Documents:
      a. Physical Address: 302 N. Independence, Ste. 1100, Enid, OK 73701; phone: 580-233-8533; website: www.holzenengineering.com .

2. Electrical/ Plumbing/ Mechanical: Integrated Consulting Engineers, Inc., 349 South Hydraulic, Wichita, KS 67211; phone: 316-264-3588; website: www.iconengineers.net.
3. Structural Engineering: Holtzen Engineering Group, 302 N. Independence, Ste. 1100, Enid, OK 73701; phone: 580-233-8533; website: www.holzenengineering.com .
4. Geotechnical Engineering: Burgess Engineering and Testing; 809 NW 34th Street, Moore, Ok 73160; phone: 405-790-0488, fax: 405-790-0788.

1.5 CONFLICTS

A. If documents illustrate a scope of work in two different methods and no clarification is given to the bidder, the bidder is to price the higher of the two methods.

1.6 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
   1. Construction of the new bus barn addition and connection to an existing bus barn and other Work indicated in the Contract Documents.
B. Type of Contract:
   1. Type of Contract: Project will be constructed under a General Contractor contract.
C. Final Property Survey: After the Work is completed, the Contractor will be responsible for the following Work: Engage the original surveyor to produce an as-built survey in order to verify that the topography of the site, including spot elevations, conform to the topography noted on the Contract Documents. Any deviations from the Contract Documents are to be noted, and brought to the attention of the Architect. Deviation from the Contract Documents is to be corrected per the Architect's direction then resurveyed for verification at Contractor's expense.

1.7 WORK PERFORMED BY OWNER

A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.
B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before Work under this Contract begins.
   1. None.
C. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract.
   1. None.
D. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract.
   1. None.

1.8 CONTRACTOR'S USE OF SITE AND PREMISES

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project. The owner will occupy adjacent portions of existing building during construction operations.
B. Partial Owner Occupancy: Coordinate occupancy with Owner.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.9 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
   2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.10 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7:00 a.m. to 7:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
   1. Weekend Hours: As negotiated with Owner.
   2. Early Morning Hours: As negotiated with Owner.
   3. Work in Existing Building: As negotiated with Owner.
   4. Hours for Utility Shutdowns: As negotiated with Owner or after school hours.
   5. Hours for Core Drilling and/ or noisy activities: As negotiated with Owner or after school hours.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
   1. Notify Architect, Construction Manager, and Owner not less than two days in advance of proposed utility interruptions.
   2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
   1. Notify Construction Manager and Owner not less than two days in advance of proposed disruptive operations.
   2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Owner's property is not permitted.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

G. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
   1. Maintain list of approved screened personnel with Owner's representative.

1.11 WATER DAMAGE

A. Contractor will be responsible for any water damages incurred as a result of construction related leaks during the construction period.

1.12 PERMITS

A. Contractor to apply for, obtain, and pay for permits required to perform the Work. Submit copies to Owner.

1.13 CODES

A. Comply with all applicable codes and regulations of authorities having jurisdiction. Submit copies of inspection reports, notices and similar communications to Owner and Contractor.

1.14 DIMENSIONS

A. Verify all dimensions indicated on Drawings with field dimensions before fabrication or ordering of materials. Do not scale Drawings.

1.15 SPECIFICATION AND DRAWING CONVENTIONS

A. Correlation and Intent of the Contract Documents: The Contract Documents are complimentary, and what is required by one shall be as binding as if required by all.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
   2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
   3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
   4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

C. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

D. Division 01 Section General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

E. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
   1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
   2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
   3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

F. Obligation of Bidder / Contractor: This Paragraph is in addition to instructions in Division 00, General Conditions and Supplementary General Conditions. At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and be thoroughly familiar with the Construction Documents, including but not limited to Specifications, Drawings, and all Addenda. The failure or omission of bidder / Contractor to examine any and all forms, instruments or documents shall in no way relieve and bidder / Contractor from any obligation required by the Documents or in respect to his bid. Failure to familiarize oneself fully of the conditions related to the Project and Documents will not relieve the successful bidder / Contractor of his obligation to furnish all material and labor necessary to carry out the Work. It is the responsibility of the Contractor to provide all materials, equipment and labor to provide a complete and working assembly or system even though some material or equipment may not be shown on the Drawings. By submitting his bid the Contractor acknowledges that adequate information has been provided for the successful completion of the Project.

1. Should a bidder find discrepancies in or omissions from the Documents, or should he be in doubt as to their meaning, he should at once notify the Architect in writing, who will send written instructions to all bidders.

1.16 MISCELLANEOUS PROVISIONS

A. Index of Construction Documents is shown on the Cover Sheet of the Drawings and Table of Contents of the Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.
B. Related Requirements:
   1. Division 00 Document 00 26 00 "Procurement Substitution Procedures" for requirements for substitution requests prior to award of Contract.
   2. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

A. Substitution Requests: Submit for each request for consideration. Submit documentation identifying product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use form provided in Project Manual.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.
      b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within ten (10) days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

1.7 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than twenty (20) days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
a. Requested substitution does not require extensive revisions to the Contract Documents.
b. Requested substitution is consistent with the Contract Documents and will produce indicated results.
c. Substitution request is fully documented and properly submitted.
d. Requested substitution will not adversely affect Contractor's construction schedule.
e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SUBSTITUTION REQUEST

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 yrs old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

☐ Point-by-point comparative data attached - REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Savings to Owner for accepting substitution: _____ ($ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

September 1996
CSI Form 13.1A

SUBSTITUTION REQUEST
(Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
B. Related Requirements:
   1. Division 01 Section "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
   2. Division 01 Section "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      e. Quotation Form: Use forms acceptable to Architect.
B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 01 21 00 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.7 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
   1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
B. Related Requirements:
   1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Owner's name.
      c. Owner's Project number.
      d. Name of Architect.
      e. Architect's Project number.
      f. Contractor's name and address.
      g. Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G703.
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site.
6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
7. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
8. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
    1. If not indicated in the Agreement Between the Owner and the Contractor, progress payments shall be submitted to Architect by the last of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
    2. Submit draft copy of Application for Payment seven (7) days prior to due date for review by Architect.
C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
    1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
    2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
    3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
    4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
    1. Items stored off site are to be stored in a licensed, bonded facility separate from and not owned by Contractor, Sub-contractor, supplier, or manufacturer.
    2. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
    3. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.

4. Provide summary documentation for stored materials indicating the following:
    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

a. Complete administrative actions, submittals, and Work preceding this application, as described in Division 01 Section "Closeout Procedures."

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Certification of completion of final punch list items.
3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
4. Updated final statement, accounting for final changes to the Contract Sum.
5. AIA Document G706.
6. AIA Document G706A.
7. AIA Document G707.
8. Evidence that claims have been settled.
9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
10. Final liquidated damages settlement statement.
11. Proof that taxes, fees, and similar obligations are paid.
12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. RFIs.
   4. Digital project management procedures.
   5. Web-based Project management software package.
   6. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
   1. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   2. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request for Information. Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in Project meeting room, in temporary field office,and in prominent location in each built facility. Keep list current at all times.

1.5 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
   1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
      a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
      b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
      c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
      d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
      e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
      f. Indicate required installation sequences.
      g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
   1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.

2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms, showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Mechanical and Plumbing Work: Show the following:
    a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
    a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
    b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
    c. Panel board, switchboard, switchgear, transformer, busway, generator, and motor-control center locations.
    d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Fire-Protection System: Show the following:
    a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
9. Review: Architect will review coordination drawings to confirm that, in general, the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section "Submittal Procedures."

C. Coordination Drawing Process: Prepare coordination drawings in the following manner:
1. Schedule submittal and review of Fire Sprinkler, Plumbing, HVAC, and Electrical Shop Drawings to make required changes prior to preparation of coordination drawings.
2. Commence routing of coordination drawing files with HVAC Installer, who will provide drawing plan files denoting approved ductwork. HVAC Installer will locate ductwork and piping on a single layer, using orange color. Forward drawings to Plumbing Installer.
3. Plumbing Installer will locate plumbing and equipment on a single layer, using blue color.
4. Fire Sprinkler Installer will locate piping and equipment, using red color. Fire Sprinkler Installer shall forward drawing files to Electrical Installer.
5. Electrical Installer will indicate service and feeder conduit runs and equipment in green color. Electrical Installer shall forward drawing files to Communications and Electronic Safety and Security Installer.

6. Communications and Electronic Safety and Security Installer will indicate cable trays and cabling runs and equipment in purple color. Communications and Electronic Safety and Security Installer shall forward completed drawing files to Contractor.
7. Contractor shall perform the final coordination review. As each coordination drawing is completed, Contractor will meet with Architect to review and resolve conflicts on the coordination drawings.

1.7 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
   2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Architect.
   5. Name of Contractor.
   6. RFI number, numbered sequentially.
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   12. Contractor's signature.
   13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
      a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716 or Form bound in Project Manual.
   1. Attachments shall be electronic files in PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow ten (ten) days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
   1. The following Contractor-generated RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for approval of Contractor's means and methods.
      d. Requests for coordination information already indicated in the Contract Documents.
      e. Requests for adjustments in the Contract Time or the Contract Sum.
      f. Requests for interpretation of Architect's actions on submittals.
      g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architectof additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."
    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10) days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within three days if Contractor disagrees with response.

1.8 PROJECT MEETINGS

A. General: Construction Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of seven days prior to meeting.
3. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
        1) Review schedule for next period.
    b. Review present and future needs of each entity present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Resolution of BIM component conflicts.
        4) Status of submittals.
        5) Status of sustainable design documentation.
        6) Deliveries.
        7) Off-site fabrication.
        8) Access.

9) Site use.
10) Temporary facilities and controls.
11) Progress cleaning.
12) Quality and work standards.
13) Status of correction of deficient items.
14) Field observations.
15) Status of RFIs.
16) Status of Proposal Requests.
17) Pending changes.
18) Status of Change Orders.
19) Pending claims and disputes.
20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
    a. Responsibilities and personnel assignments.
    b. Tentative construction schedule.
    c. Phasing.
    d. Critical work sequencing and long lead items.
    e. Designation of key personnel and their duties.
    f. Lines of communications.
    g. Procedures for processing field decisions and Change Orders.
    h. Procedures for RFIs.
    i. Procedures for testing and inspecting.
    j. Procedures for processing Applications for Payment.
    k. Distribution of the Contract Documents.
    l. Submittal procedures.
    m. Preparation of Record Documents.
    n. Use of the premises and existing building.
    o. Work restrictions.
    p. Working hours.
    q. Owner's occupancy requirements.
    r. Responsibility for temporary facilities and controls.
    s. Procedures for moisture and mold control.
    t. Procedures for disruptions and shutdowns.
    u. Construction waste management and recycling.
    v. Parking availability.
    w. Office, work, and storage areas.
    x. Equipment deliveries and priorities.
    y. First aid.
    z. Security.

aa. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   a. Contract Documents.
   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Review of mockups.
   i. Possible conflicts.
   j. Compatibility requirements.
   k. Time schedules.
   l. Weather limitations.
   m. Manufacturer's written instructions.
   n. Warranty requirements.
   o. Compatibility of materials.
   p. Acceptability of substrates.
   q. Temporary facilities and controls.
   r. Space and access limitations.
   s. Regulations of authorities having jurisdiction.
   t. Testing and inspecting requirements.
   u. Installation procedures.
   v. Coordination with other work.
   w. Required performance results.
   x. Protection of adjacent work.
   y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and

other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    a. Preparation of Record Documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Procedures for completing and archiving web-based Project software site data files.
    d. Submittal of written warranties.
    e. Requirements for preparing operations and maintenance data.
    f. Requirements for delivery of material samples, attic stock, and spare parts.
    g. Requirements for demonstration and training.
    h. Preparation of Contractor's punch list.
    i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    j. Submittal procedures.
    k. Owner's partial occupancy requirements.
    l. Installation of Owner's furniture, fixtures, and equipment.
    m. Responsibility for removing temporary facilities and controls.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Coordination Meetings: Construction Manager will conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting, where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    c. Review present and future needs of each contractor present, including the following:
        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site use.

8) Temporary facilities and controls.
9) Work hours.
10) Hazards and risks.
11) Progress cleaning.
12) Quality and work standards.
13) Status of RFIs.
14) Proposal Requests.
15) Change Orders.
16) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

AGREEMENT FOR TRANSFER OF INFORMATION MACHINE-READABLE FORMAT

By and Between Renaissance Architecture, LLC., Oklahoma City, Oklahoma (hereinafter referred to as ARCHITECT) and _____ (hereinafter referred to as RECIPIENT).

Upon receipt of this signed agreement, the electronic media (instruments of professional service) will be provided pursuant to your request for the purpose of _____.

In using it, modifying it, or accessing information from it, RECIPIENT is responsible for confirmation, accuracy, and checking of the data from the media. ARCHITECT hereby disclaims any and all responsibility from any results obtained in use of this electronic media and does not guarantee any accuracy of the information.

RECIPIENT agrees that it shall not use the information provided by ARCHITECT for any purpose other than that described above without the express written consent of ARCHITECT.

RECIPIENT understands that the automated conversion of information and data from the system and format used by ARCHITECT to alternate system of format cannot be accomplished without the possibility of introduction if inexactitudes, anomalies, and errors. In the event project documentation provided to RECIPIENT in machine readable form is so converted, RECIPIENT agrees to assume all risk associated therewith, and to the fullest extent permitted by law, to hold harmless and indemnify ARCHITECT from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees, arising therefrom or in connection therewith.

RECIPIENT recognizes that changes or modifications to instruments of professional service introduced by anyone other than ARCHITECT may result in adverse consequences that ARCHITECT can neither predict nor control. Therefore, and in consideration of ARCHITECT'S agreement to deliver its instruments of professional service in machine readable format, RECIPIENT agrees, to the fullest extent permitted by law to hold harmless and indemnify ARCHITECT from and against all claim, liabilities, losses, damages, and costs, including misuse or reuse by others of the machine readable information and data provided by ARCHITECT under this Agreement. The foregoing indemnification applies, without limitation, to any use of the project documentation on another project, for additions to this project, or for completion of this project by others; ARCHITECT may authorize excepting only such use in writing.

Send a signed agreement to receive electronic media.

Signature	Signature
_____	_____
Renaissance Architecture, LLC.	_____
Name _____	Name _____
Date _____	Date _____

Ship To: _____

Phone: _____

Fax: _____

Advancement of Construction Technology

REQUEST FOR INTERPRETATION

Project: _____ R.F.I. Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Section: Paragraph: Drawing Reference: Detail:

Request:

Signed by: Date:

Response:

☐ Attachments

Response From: To: Date Rec'd: Date Ret'd:

Signed by: Date:

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for the following:
   1. Preconstruction photographs.
   2. Concealed Work photographs.
   3. Periodic construction photographs.
   4. Final Completion construction photographs.
   5. Preconstruction video recordings.
   6. Periodic construction video recordings.

B. Related Requirements:
   1. Division 01 Section "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
   2. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.
   3. Division 02 Section "Selective Demolition" for photographic documentation before selective demolition operations commence.

1.3 SUBMITTALS

A. Submit photos of construction follows:
   1. Take photos of progress at regular weekly intervals.
   2. Take photos at each major stage.
      a. At each erection stage.
      b. Before during and after each concrete pour.

B. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

C. Digital Photographs: Submit image files within three days of taking photographs.
   1. Submit photos on CD-ROM or thumb-drive. Include copy of key plan indicating each photograph's location and direction.
   2. Identification: Provide the following information with each image description in file metadata tag:
      a. Name of Project.
      b. Name and contact information for photographer.
      c. Name of Architect.
      d. Name of Contractor.
      e. Date photograph was taken.
      f. Description of location, vantage point, and direction.
      g. Unique sequential identifier keyed to accompanying key plan.

D. Video Recordings: Submit video recordings within seven days of recording.
   1. Submit video recordings on CD-ROM or thumb drive. Include copy of key plan indicating each video's location and direction.

2. Identification: With each submittal, provide the following information in file metadata tag:
   a. Name of Project.
   b. Name and address of photographer.
   c. Name of Architect.
   d. Name of Contractor.
   e. Date video recording was recorded.
   f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
3. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in three-ring binders. Provide label on front and spine. Include a cover sheet with label information. Include name of Project and date of video recording on each page.

1.4 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.5 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels, and with vibration-reduction technology. Use flash in low light levels or backlit conditions.
B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full high-definition mode with vibration-reduction technology. Provide supplemental lighting in low light levels or backlit conditions.
C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
D. Metadata: Record accurate date and time and GPS location data from camera.
E. File Names: Name media files with date and Project area and sequential numbering suffix.

1.6 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified photographer to take construction photographs.
B. General: Take photographs with maximum depth of field and in focus.
   1. Maintain key plan with each set of construction photographs that identifies each photographic location.
C. Preconstruction Photographs: Before commencement of the Work, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
   1. Flag excavation areas and construction limits before taking construction photographs.
   2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
   3. Take 20 photographs of existing buildings either on or adjoining property, to accurately record physical conditions at start of construction.
   4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

D. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:
   1. Underground utilities.
   2. Underslab services.
   3. Piping.
   4. Electrical conduit.
   5. Waterproofing and weather-resistant barriers.

E. Periodic Construction Photographs: Take 20 – 50 photographs weekly and coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

F. Final Completion Construction Photographs: Take 20 – 50 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

1.7 CONSTRUCTION VIDEO RECORDINGS

A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.

B. Narration: Describe scenes on video recording by audio narration by microphone while or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
   1. Confirm date and time at beginning and end of recording.
   2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.

C. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.

D. Preconstruction Video Recording: Before starting excavation, demolition, and construction, record video recording of Project site and surrounding properties from different vantage points, as directed by Architect.
   1. Flag excavation areas and construction limits before recording construction video recordings.
   2. Show existing conditions adjacent to Project site before starting the Work.
   3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of excavation, demolition, and construction.
   4. Show protection efforts by Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Submittal schedule requirements.
   2. Administrative and procedural requirements for submittals.

B. Related Requirements:
   1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Division 01 Section "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
   3. Division 01 Section "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and Final Completion construction photographs.
   4. Division 01 Section "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
   5. Division 01 Section "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
   6. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 SUBMITTAL SCHEDULE

A. Submittal Schedule: Within twenty-one (21) days after Contractor has received Owner’s Notice to Proceed, submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
   1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
   2. Initial Submittal Schedule: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals

required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

3. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    a. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
4. Format: Arrange the following information in a tabular format:
    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Name of subcontractor.
    d. Description of the Work covered.
    e. Scheduled date for Architect's final release or approval.
    f. Scheduled dates for purchasing.
    g. Scheduled date of fabrication.
    h. Scheduled dates for installation.
    i. Activity or event number.

1.5 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:
    1. Project name.
    2. Date.
    3. Name of Architect.
    4. Name of Construction Manager.
    5. Name of Contractor.
    6. Name of firm or entity that prepared submittal.
    7. Names of subcontractor, manufacturer, and supplier.
    8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
    9. Category and type of submittal.
    10. Submittal purpose and description.
    11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
    12. Drawing number and detail references, as appropriate.
    13. Indication of full or partial submittal.
    14. Location(s) where product is to be installed, as appropriate.
    15. Other necessary identification.
    16. Remarks.
    17. Signature of transmitter.

B. Include the following information as keywords in the electronic file metadata:
    1. Project name.
    2. Number and title of appropriate Specification Section.
    3. Manufacturer name.
    4. Product name.

C. Options: Identify options requiring selection by Architect.

D. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
   1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
   2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
   3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect, through Construction Manager, will return two copies.
   4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
   5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect or Construction Manager observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
   6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using AIA Document G810 transmittal form.

1.6 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.
      a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
   2. Contractor to provide: Minimum of one hard copy of each submittal to be provided for Owner’s file.
   3. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Sections “Project Record Documents” and "Closeout."

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
   3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
   4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. Submittals received by Architect after 1:00 p.m. will be considered as received the following working day. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block, and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

1.7 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Color charts showing full range of color options.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams that show factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
   1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
   2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
      a. Project name and submittal number.
      b. Generic description of Sample.
      c. Product name and name of manufacturer.
      d. Sample source.
      e. Number and title of applicable Specification Section.
      f. Specification paragraph number and generic name of each item.
   3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics and identification information for record.
   4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
      a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
      a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
   6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
      a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
         1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
         2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

G. Certificates:
   1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
   2. Installer Certificates: Submit written statements on manufacturer's letterhead, certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
   3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead, certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
   4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
   5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
   6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:
   1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for substrate preparation and primers required.
   2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
   3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
   4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
   5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
   6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
      a. Name of evaluation organization.
      b. Date of evaluation.
      c. Time period when report is in effect.
      d. Product and manufacturers' names.

e. Description of product.
f. Test procedures and results.
g. Limitations of use.

1.8 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.9 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with an approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

C. Submittal Stamp: When the AIA Document A201 is part of the Construction Documents and the Agreement between the Owner and Contractor, the following shall be in effect:
1. When the Contractor makes submissions to the Architect, use a stamp resembling the example shown at right. All stamps shall have original signatures. At the minimum, the Contractor shall mark each submittal as "Approved" or "Approved for Construction", and include the company name, an original signature and the date. Submittals marked "Approved for Review", "Approved for Architect's Review" or similar statements, where the intent and the scope of the approval are unclear, will be returned.
a. Include the following:
1) Project name and location
2) Specification Section title and number
3) Submittal number
4) Name of reviewer
5) Date of Contractor's approval
6) Statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

2. Refer to **Section 3.12 of AIA Document A201**, and Note the following requirements:
   a. "3.12.5 **The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect** Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect".
   b. "3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) **reviewed and approved them**, (2) **determined and verified materials, field measurements and field construction criteria related thereto, or will do so** and (3) **checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.**"
3. The Architect reserves the right to return any submittals that do not comply.

D. The General Contractor is responsible for delivering and picking up all submittals to and from the office of the Architect.

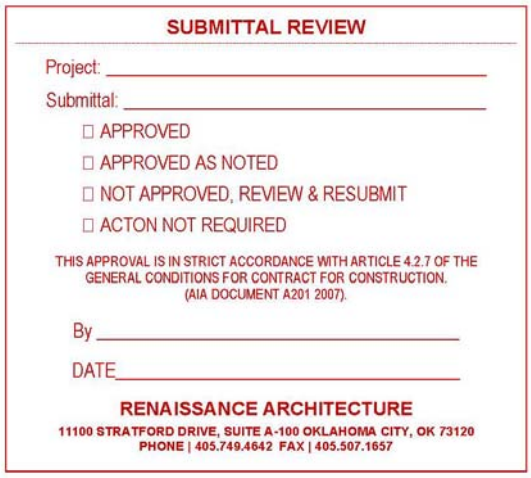
1.10 ARCHITECT'S REVIEW

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Except for submittals for the record or information, where action and return is required, the Architect will review each submittal, mark to indicate action taken, and return promptly.
   1. Compliance with specified characteristics is the Contractor's responsibility.

C. Action Submittals: Architect will review each submittal, indicate corrections or revisions required.
   1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action, as noted on the Action Stamp.

D. Action Stamp: The Architect , or the Architect's Consultants, will stamp each submittal with a uniform, action stamp. The stamp will be marked appropriately to indicate the action taken, as follows:
   1. **Approved:** When the Architect marks a submittal "Approved," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents.
   2. **Approved as Noted:** When the Architect marks a submittal "Approved as Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.
      a. Do not use, or allow others to use, submittals marked "Not Approved, Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.


SUBMITTAL REVIEW

Project: _____

Submittal: _____

☐ APPROVED

☐ APPROVED AS NOTED

☐ NOT APPROVED, REVIEW & RESUBMIT

☐ ACTON NOT REQUIRED

THIS APPROVAL IS IN STRICT ACCORDANCE WITH ARTICLE 4.2.7 OF THE GENERAL CONDITIONS FOR CONTRACT FOR CONSTRUCTION. (AIA DOCUMENT A201 2007).

By _____

DATE_____

RENAISSANCE ARCHITECTURE

11100 STRATFORD DRIVE, SUITE A-100 OKLAHOMA CITY, OK 73120

PHONE | 405.749.4642 FAX | 405.507.1657

   3. **Not Approved, Revise and Resubmit:** When the Architect marks a submittal "Not Approved, Revise and Resubmit," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new

submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.

a. Do not use, or allow others to use, submittals marked "Not Approved, Revise and Resubmit" at the Project Site or elsewhere where Work is in progress.

4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the Architect will return the submittal marked "Action Not Required."

E. Unsolicited Submittals: The Architect will return unsolicited submittals to the sender without action.

F. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

G. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

H. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

I. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

J. Architect will discard submittals received from sources other than Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of ten previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.

1. Mockups are used for one or more of the following:
    a. Verify selections made under Sample submittals.
    b. Demonstrate aesthetic effects.
    c. Demonstrate the qualities of products and workmanship.
    d. Demonstrate successful installation of interfaces between components and systems.
    e. Perform preconstruction testing to determine system performance.
2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect or Construction Manager.

1.4 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional licensed in the project state, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

A. Mockup Shop Drawings:
   1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
   2. Indicate manufacturer and model number of individual components.
   3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
B. Qualification Data: For Contractor's quality-control personnel.
C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.
E. Reports: Prepare and submit certified written reports and documents as specified.
F. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
   1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and

inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.

2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
   1. Provide test specimens representative of proposed products and construction.
   2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.

5. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.
7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

1.11 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.
   a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-

control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures, and reviewing the completeness and adequacy of those procedures to perform the Work.
   2. Notifying Architect, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
   4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
   6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and Construction Manager's reference during normal working hours.
   1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as

possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 42 00 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.
B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
H. "Provide": Furnish and install, complete and ready for the intended use.
I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
    1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.
C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
    1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
   1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
   2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
   3. ICC - International Code Council; www.iccsafe.org.
   4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
   1. COE - Army Corps of Engineers; www.usace.army.mil.
   2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
   3. EPA - Environmental Protection Agency; www.epa.gov.
   4. OSHA - Occupational Safety & Health Administration; www.osha.gov.
   5. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 45 29 - TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 SCOPE

A. Related Requirements Specified Elsewhere:

1. Refer to paragraphs 3.3.3, 4.2.6, 4.2.9, 9.4.2, 12.2.1, 13.5 of the General Conditions.
2. In the event of conflict between requirements of the General Conditions and this Section concerning testing laboratory services, for the specific items of construction listed in this section, the requirements of this section shall govern.

1.2 DESCRIPTION

A. An Independent Testing Laboratory, selected by the Owner and paid for by the Owner, shall perform the professional testing and laboratory services.
B. Materials and workmanship not meeting the required standards of performance obligations are to be removed and replaced at the Contractor's expense, including all subsequent testing.
C. Where the terms "Inspector" and "Testing Laboratory" are used, they mean and refer respectively to an officially designated and accredited inspector of the testing laboratory and the testing laboratory engaged by the Owner.

1.3 WORK INCLUDED

A. Inspection and testing of soils for compaction, density, moisture content, and identification of proper bearing strata.
B. Inspection and testing of drilled piers including location of bearing strata, depth to strata from surface, embedment in strata, tolerances, shaft diameters, concrete cover, reinforcing, and concrete.
C. Inspection and testing of concrete work including design mixes, placement, strength, air content, water content, and curing.
D. Inspection and testing of structural steel including anchor bolts, high strength bolts, field and shop welds, and inspection of structural steel, joists, joist girders, and bridging.
E. Inspection and testing of light gage steel including steel deck and steel framing size, gage and connections.
F. Keeping inspection and test logs of all inspections and tests.
G. Submitting to Architect, Engineer, Contractor and Owner certifications, records and reports of all inspections and tests.

1.4 SUBMITTALS (CERTIFICATION)

A. Submit one copy each to Architect, Consulting Engineers, Contractor and Owner of certification of each inspection and test required.
B. In each certificate state details of each inspection and test to indicate satisfactory compliance with requirements of the specifications and/or drawings or unsatisfactory conditions or failure to comply with requirements.

1.5 RESPONSIBILITIES OF CONTRACTOR REGARDING TESTING LABORATORY

A. Owner's selection of the laboratory and laboratory testing and inspection in no way relieves the Contractor of his responsibility to furnish materials and construction in full compliance with the Contract Drawings.

B. Notify the laboratory of material sources and furnish without cost, necessary quantities of representative samples to laboratory of materials proposed for use which are required to be tested.
C. Give timely notice to the laboratory when the various construction operations requiring testing or inspection are to be performed.
D. Advise laboratory to complete any required check-tests and assign personnel for field inspection and testing as specified.
E. Provide adequate facilities for safe storage of test samples on project site.
F. Furnish such nominal labor as is required to assist laboratory personnel in obtaining and handling samples at site.

1.6 AUTHORITY AND DUTIES OF LABORATORY PERSONNEL

A. Laboratory personnel shall inspect and/or test materials, assemblies, specimens, and work performed including design mixes, methods and techniques as specified and report results to Architect, Consulting Engineers, Owner and Contractor.
B. Should it appear that the material furnished or work performed fails to meet requirements of Contract Drawings, laboratory shall direct the attention of the Contractor and the Owner's Representative to such failure or infringement.
C. The laboratories are not authorized to revoke, alter, relax, enlarge or release any requirements of the Contract Drawings, or to approve or accept any portion of the work. The duty of the laboratories is to test and/or sample and report on a timely basis.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials in conjunction with the work of the Section shall be as required for the various tests.

PART 3 - EXECUTION

3.1 SOIL AND FOUNDATION BEARING

A. Refer to Division 00 Section “Geotechnical Data” and Geotechnical Engineering Services Report (For Reference Only) for specific requirements.

3.2 CONCRETE

A. Refer to Division 03 Section “Structural Concrete” for specific requirements of typical concrete. These apply to all concrete placed for Division 03 Section “Structural Concrete”.

3.3 STRUCTURAL STEEL

A. Refer to Division 05 Sections “Structural Steel Framing”, “Architecturally Exposed Structural Steel (AESS)”, “Steel Joist Framing”, and “Steel Decking” for specific requirements.

3.4 LIGHT GAGE STEEL

A. Refer to Division 05 Section “Cold- Formed Metal Framing” for specific requirements.

END OF SECTION

SECTION 01 45 33 - SPECIAL INSPECTIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SPECIAL INSPECTIONS

A. Each facility shall be designed and constructed in compliance with most currently adopted edition of the International Building Code. Chapter 17, Structural Tests and Inspections; Section 1704, Special Inspections requires that a special inspector inspect certain elements of the work. The Owner will employ and pay for the services of independent individuals and/or firm, to perform special inspections of the on-site project inspections in compliance with the code.

B. The Contractor shall coordinate and provide all necessary assistance to the special inspector in compliance with the inspection requirements of the code. The Contractor will notify the special inspector, a minimum of forty-eight (48) hours prior to inspection of those elements of work specified by the code.

1.3 REPORT REQUIREMENTS BY THE SPECIAL INSPECTOR

A. Special inspectors will record and maintain records of all inspections. Reports shall be furnished to the code official and the Architect.

B. The special inspector will provide to the Contractor, code official, and Architect a report of all items found not to be in compliance to the code and contract documents. A final report of inspections documenting completion of all required special inspections and correction of any discrepancies noted in the inspections shall be submitted to the code official, and the Architect prior to the issuance of a Certificate of Occupancy. Section 1704.1.2 outlines the records responsibility of the code official.

1.4 REQUIRED INSPECTION

A. Inspection of the contractor's fabricator(s):

1. Fabrication of structural load bearing members and assemblies performed on the premises of a fabricator's shop shall have special inspection (see exceptions).
2. The special inspector will verify that the contractor's fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the contractor's fabricator ability to gain compliance with the contract documents and referenced standards. The inspection will be examining the items for completeness and adequacy relative to the code requirements for the contractor's

fabricator scope of work.

B. Exceptions to a special inspector at a fabrication shop:

1. Special inspections are not required when the Contractor's fabricator has contracted an approved independent inspection or quality control agency to conduct periodic in-plant inspections at the fabricator's plant. Frequency of the inspection will assure that the contractor's fabricator conformance to the requirements of the inspection agency's approved quality control program. This program must be submitted to the special inspector for review.
2. The Contractor's steel fabricator must submit a detailed procedure to the approved special inspector and code official for material control which demonstrates the fabricator's ability to maintain suitable records and procedures, such that, at any time during the fabrication process, the material specification, grade and mill test reports for the main stress-carrying elements and bolts can be determined. The steel products should not be incorporated into the work until acceptance of submitted procedure.

C. Exceptions to steel fabrication: Special inspection of steel fabrication process is not required when the contractor's fabricator does not perform the following:

1. Welding.
2. Thermal cutting.
3. Heating operation of any kind as part of the fabrication process.

D. Inspections during construction:

1) Metal structures:

a. All main stress-carrying elements, welding material and bolting material shall conform to Table 1704.3 prior to erection.
b. Special inspections are required for bolts, welding and details as specified below:
1) Installation of high strength bolts: Inspection shall be *as* specified in Section 8 of the AISC Specifications for Structural Joints Using A325 or A490 bolts listed in Appendix A.
2) Welding inspection shall be in compliance with Section 6 of SWS D1.1 listed in Appendix A. Weld inspectors shall be certified in accordance with AWS D1.1 listed in Appendix A.
3) The special inspector shall perform an inspection of the steel frame to verify compliance with the details shown on the approved drawings, such as bracing, stiffening, member locations and proper application of joint details at each connection.

c. Concrete construction:
1) In the absence of sufficient data or documentation providing evidence of

conformance to quality standards for materials in Chapter 3 of ACI 318 listed in Appendix A, testing shall be required of materials in accordance with the appropriate standards and criteria for the material in Chapter 3 of ACI 318. The testing of materials shall be performed by an independent testing lab.

2) The location and installation details of reinforcing and pre-stressing steel shall be inspected for compliance with the approved drawings, specifications and ACI 318 (as Section 7.4, 7.5, 7.6 and 7.7).

3) Forms for concrete, if used, shall be inspected for compliance with section 6.1of ACI 318 listed in Appendix A, and with any additional design requirements specified on the approved plans and specifications. Inspection of form removal and restoring shall be conducted to verify compliance with Section 6.2 of ACI 318.

4) During placing and curing of the concrete, the following special inspections shall be performed.
   a) Evaluation of concrete strength, except as exempted by section 1905.6.3.3 of the BOCA Code (ACI 318 section 5.6).
   b) Inspection for use of proper mix proportions and proper mix techniques (ACI 318, sections 5.2, 5.3, 5.4 and 5.8).
   c) Inspection during concrete placement, for proper application techniques (ACI 318, section 5.9 and 5.10).
   d) Inspection for maintenance of specified curing temperatures and techniques. (ACI 3 I 8, sections 5.11, 5.12 and 5.13).

5) Exceptions to concrete construction: Special inspection shall not be required for the following:
   a) Concrete footings of buildings three stories or less in height which are fully supported on the earth or rock.
   b) Nonstructural concrete slabs supported directly on the ground, including prestressed slabs on grade, when the effective prestress in the concrete is less than 150 psi.
   c) Plain concrete foundation walls constructed in accordance with Table 1805.5(1), 1805.5(2), 1805.5(3) and 1805.5(4).

6) Precast/prestressed concrete:
   a) Special inspections of precast/prestressed concrete structural members can be done by the Contractor's fabricator independent quality control inspector, as long as the structural members are inspected as fabricated items, and comply with Article 4.b of this section.
   b) Inspection during the application of prestressing forces shall be performed to determine compliances with section 18.18 of AC1 318.
   c) Inspection of the manufacture of precast concrete shall be in accordance with PC1 MNL 116 and 117.
   d) Erection of precast concrete shall be inspected for compliance with approved plans and erection drawings.

E. Masonry construction: The following special inspections for masonry construction shall be as follows in accordance with ACI 530/ASCE 6:

1. Material (ACI 530.1/ASCE 6, section 2.2).
2. Masonry strength (ACI 530.I/ASCE 6, 1.6).
3. Construction operations:
   a. Proportioning, mixing consistency of mortar and grout (ACI 530.1/ASCE 6, section 2.6A).
   b. Application of mortar grout and masonry units (ACI 530.1/ASCE 6, section 3.5).
   c. Condition, size, location and spacing of reinforcement (AC1 530/ASCE 6, section 1.12).
   d. Protection of masonry during cold weather, temperature below 40F; or hot weather, temperature above 90F (ACI 530.1/ASCE 6 section 1.8).e. Anchorage (ACI 530.1/ASCE 6 sections 1.15.4 and 2.1.2).

4. Exceptions to masonry construction:
   a. Special inspection shall not be required for foundation walls constructed in accordance with Table 1805.5(1), 1805.5(2), 1805.5(3) and 1805.5(4).

F. Exterior Insulation and Finish Systems:

1. The following special inspection of EIFS are required:
   a. The special inspector shall be present when EIFS applications are being installed or during tests. Reference International Building Code section 1704.12.
   b. The special inspector shall submit detailed records of the installation of all EIFS applications.

G. Special cases: Special inspections shall be required for proposed work which is, in the opinion of the code official, unusual in its nature. The Contractor, Architect, and/or special inspector can bring any items to the attention of the code official that they feel might require special inspections.
   1. Construction of materials and systems which are alternatives to materials and systems prescribed by the International Building Code.
   2. Unusual design applications of materials described in the International Building Code.
   3. Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in the International Building Code or in standards referenced by the International Building Code.

1.5 PAYMENT

A. The cost of special inspections shall be paid by the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
B. Related Requirements:
   1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
B. Sewer Service: Provide temporary connections and extensions of services as required for construction operations. Construction of permanent connections and extensions of services may be utilized as temporary connections and extensions of services during the construction process.
C. Electric Power Service from Existing System: Provide connections and extensions of services as required for construction operations. Construction of permanent connections and extensions of services may be utilized as temporary connections and extensions of services during the construction process.

1.4 SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
   1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.

2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste-handling procedures.
5. Other dust-control measures.

G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
1. Methods used to meet the goals and requirements of the Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized-steel bases for supporting posts.

B. Wood Enclosure Fence: Plywood, 6 feet (1.8 m) high, framed with four 2-by-4-inch (50-by-100-mm) rails, with preservative-treated wood posts spaced not more than 8 feet (2.4 m) apart.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches (914 by 1524 mm).
E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:
   1. Furniture required for Project-site documents, including file cabinets, plan tables, plan racks, and bookcases.
   2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack and marker boards.
   3. Drinking water and private toilet.
   4. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
   5. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.
C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
   3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures."
C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Section 01 10 00 "Summary."
B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
   1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
      a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
      b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
   1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
   1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment for each field office.
   1. Provide additional telephone lines for the following:
   2. At each telephone, post a list of important telephone numbers.
      a. Police and fire departments.
      b. Ambulance service.
      c. Contractor's home office.
      d. Contractor's emergency after-hours telephone number.
      e. Architect's office.
      f. Engineers' offices.
      g. Owner's office.
      h. Principal subcontractors' field and home offices.

I. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.3 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:
   1. Provide construction for temporary field offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
   2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated within construction limits indicated on Drawings.
   1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Planned Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
   1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
   2. Prepare subgrade and install subbase and base for temporary roads and paved areas in accordance with Division 31 "Earth Moving."
   3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
   4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course in accordance with Division 32 "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
   1. Protect existing site improvements to remain, including curbs, pavement, and utilities.
   2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
F. Storage and Staging: Use designated areas of Project site for storage and staging needs.
G. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
    1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
    2. Remove snow and ice as required to minimize accumulations.
H. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
    1. Identification Signs: Provide Project identification signs as indicated on Drawings.
    2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
        a. Provide temporary, directional signs for construction personnel and visitors.
    3. Maintain and touch up signs, so they are legible at all times.
I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."
J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
    1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
K. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
L. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
    1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas, so no evidence remains of correction work.
M. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
    1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
    1. Comply with work restrictions specified in Division 01 Section "Summary."
C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
    1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.

2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.

G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
1. Extent of Fence: As indicated on Drawings.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.

K. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.
1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
2. Paint and maintain appearance of walkway for duration of the Work.

L. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

M. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
1. Construct dustproof partitions with gypsum wallboard, with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
2. Construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.

3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
4. Insulate partitions to control noise transmission to occupied areas.
5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
6. Protect air-handling equipment.
7. Provide walk-off mats at each entrance through temporary partition.

N. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas and on school property.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.

3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
    1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
    1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
    2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
    3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
   1. Construction layout.
   2. Field engineering and surveying.
   3. Installation of the Work.
   4. Cutting and patching.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.
   8. Correction of the Work.

B. Related Requirements:
   1. Division 01 Section "Submittal Procedures" for submitting surveys.
   2. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
   3. Division 02 Section "Selective Demolition" for demolition and removal of selected portions of the building.
   4. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 PREINSTALLATION MEETINGS

A. Cutting and Patching Conference: Conduct conference at Project site.
   1. Prior to submitting cutting and patching plan, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
      a. Contractor's superintendent.
      b. Trade supervisor responsible for cutting operations.
      c. Trade supervisor(s) responsible for patching of each type of substrate.
      d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
   2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

B. Layout Conference: Conduct conference at Project site.
   1. Prior to establishing layout of new and existing perimeter and structural column grid(s), review building location requirements. Review benchmark, control point, and layout and

dimension requirements. Inform Architect and Construction Manager of scheduled meeting. Require representatives of each entity directly concerned with Project layout to attend, including the following:

a. Contractor's superintendent.
b. Professional surveyor responsible for performing Project surveying and layout.
c. Professional surveyor responsible for performing site survey serving as basis for Project design.

2. Review meanings and intent of dimensions, notes, terms, graphic symbols, and other layout information indicated on the Drawings.
3. Review requirements for including layouts on Shop Drawings and other submittals.
4. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.
B. Certified Surveys: Submit two copies signed by land surveyor.
C. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.
D. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
   1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
   2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
   3. Products: List products to be used for patching and firms or entities that will perform patching work.
   4. Dates: Indicate when cutting and patching will be performed.
   5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
      a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.5 CLOSEOUT SUBMITTALS

A. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.6 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
   1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting

and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Plumbing piping systems.
    f. Mechanical systems piping and ducts.
    g. Control systems.
    h. Communication systems.
    i. Fire-detection and -alarm systems.
    j. Electrical wiring systems.
    k. Operating systems of special construction.
3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.
    f. Piping, ductwork, vessels, and equipment.
    g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.
    1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
    1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
   2. List of detrimental conditions, including substrates.
   3. List of unacceptable installation tolerances.
   4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through

Construction Manager in accordance with requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect and Construction Manager promptly.

B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish limits on use of Project site.
   3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   4. Inform installers of lines and levels to which they must comply.
   5. Check the location, level and plumb, of every major element as the Work progresses.
   6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
   7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
   1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
   2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
   2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. **Final Property Survey: After the Work is completed, the Contractor will be responsible for the following Work: Engage the original surveyor to produce an as-built survey in order to verify that the topography of the site, including spot elevations, conform to the topography noted on the Contract Documents. Any deviations from the Contract Documents are to be noted, and brought to the attention of the Architect. Deviation from the Contract Documents is to be corrected per the Architects's direction then resurveyed for verification at Contractor's expense.**

3.5 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb, and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces, unless otherwise indicated on Drawings.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.6 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of Work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Division 01 Section "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
   1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
   2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
   3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
   4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
   5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
   6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
   1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
   2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
      a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
      b. Restore damaged pipe covering to its original condition.
   3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall

coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.
   4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
B. Site: Maintain Project site free of waste materials and debris.
C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 50 00 "Temporary Facilities and Controls."
H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
C. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.
    1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
C. Restore permanent facilities used during construction to their specified condition.
D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
E. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
F. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
   1. Substantial Completion procedures.
   2. Final completion procedures.
   3. Warranties.
   4. Final cleaning.

B. Related Requirements:
   1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
   2. Division 01 Section "Photographic Documentation" for submitting Final Completion construction photographic documentation.
   3. Division 01 Section "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
   4. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

1.3 DEFINITIONS

A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cleaning agent.
B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.
B. Certificate of Insurance: For continuing coverage.
C. Field Report: For pest-control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
   1. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
   2. Prepare a schedule for completion of punchlist items. Update schedule based on inspection list of items to be completed (punch list) from inspection(s) by Architect, Engineers, Consultants, and Owner.
   3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   5. Prepare and submit Project Record Documents, maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
   6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   7. Complete final cleaning requirements.
   8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
   3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
      a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
   5. Submit testing, adjusting, and balancing records.
   6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Advise Owner of pending insurance changeover requirements.
   2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Advise Owner of changeover in utility services.
6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements.
9. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
   1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
   1. Submit a final Application for Payment in accordance with Division 01 Section "Payment Procedures."
   2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Submit pest-control final inspection report.
   5. Submit Final Completion photographic documentation.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.
4. Submit list of incomplete items in the following format:
    a. MS Excel Electronic File: Architect will return annotated file.
    b. PDF Electronic File: Architect will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
    1. Submit on digital media acceptable to Architect.
D. Warranties in Paper Form:
    1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
    2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
    3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
E. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
    i. Vacuum and mop concrete.
    j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    l. Remove labels that are not permanent.
    m. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
        1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
    n. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    q. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
        1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.

r. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
s. Clean strainers.
t. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste-disposal requirements in Division 01 Section "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Division 01 Section "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION

Advancement of Construction Technology

PUNCH LIST

Project: _____

_____

To (Contractor): _____

_____

From (A/E): _____

Site Visit Date: _____

A/E Project Number: _____

Contract For: _____

The following items require the attention of the Contractor for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Item Number	Room Number	Location (Area)	Description	Correction/Completion Date	Verification A/E Check

☐ Attachments

Signed by: Date:

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

September 1996
CSI Form 14.1A

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
   1. Operation and maintenance documentation directory manuals.
   2. Emergency manuals.
   3. Systems and equipment operation manuals.
   4. Systems and equipment maintenance manuals.
   5. Product maintenance manuals.

B. Related Requirements:
   1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:
   1. Submit on digital media acceptable to Architect. Enable reviewer comments on draft submittals.
   2. Submit three paper copies. Architect, through Construction Manager, will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

E. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
   1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
   2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
      b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
   4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
   5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
      a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
      b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name and contact information for Contractor.
   6. Name and contact information for Construction Manager.
   7. Name and contact information for Architect.
   8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
   1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
   1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
   2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
   3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
   1. Fire.
   2. Flood.
   3. Gas leak.
   4. Water leak.
   5. Power failure.
   6. Water outage.
   7. System, subsystem, or equipment failure.
   8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:
   1. Instructions on stopping.
   2. Shutdown instructions for each type of emergency.
   3. Operating instructions for conditions outside normal operating limits.
   4. Required sequences for electric or electronic systems.
   5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
   1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
   2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
   1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
   2. Performance and design criteria if Contractor has delegated design responsibility.
   3. Operating standards.
   4. Operating procedures.
   5. Operating logs.
   6. Wiring diagrams.
   7. Control diagrams.
   8. Piped system diagrams.
   9. Precautions against improper use.
   10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:
   1. Product name and model number. Use designations for products indicated on Contract Documents.
   2. Manufacturer's name.

3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
   1. Record Drawings.
   2. Record specifications.
   3. Record Product Data.
   4. Miscellaneous record submittals.

B. Related Requirements:
   1. Division 01 Section "Execution" for final property survey.
   2. Division 01 Section "Closeout Procedures" for general closeout procedures.
   3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of Record Drawings as follows:
      a. Initial Submittal:
         1) Submit one paper-copy set(s) of marked-up record prints.
         2) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
         3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit three paper-copy set(s) of marked-up record prints.
         2) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
      c. Final Submittal:
         1) Submit one paper-copy set(s) of marked-up record prints.
         2) Submit Record Digital Data Files and three set(s) of Record Digital Data File plots.

B. Record Specifications: Submit annotated PDF electronic files and one paper copies of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
      e. Cross-reference record prints to corresponding photographic documentation.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order or Construction Change Directive.
      k. Changes made following Architect's written orders.
      l. Details not on the original Contract Drawings.
      m. Field records for variable and concealed conditions.
      n. Record information on the Work that is shown only schematically.
   3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
   4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
   5. Mark important additional information that was either shown schematically or omitted from original Drawings.
   6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

1.5 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record specifications as annotated PDF electronic file, paper copy, scanned PDF electronic file(s) of marked-up paper copy of Specifications.

1.6 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit Record Product Data as annotated PDF electronic file, paper copy, scanned PDF electronic file(s) of marked-up paper copy of Product Data.
1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file, paper copy, scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Instruction in operation and maintenance of systems, subsystems, and equipment.
   2. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
   1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For instructor.

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
   1. Identification: On each copy, provide an applied label with the following information:
      a. Name of Project.
      b. Name and address of videographer.
      c. Name of Architect.
      d. Name of Construction Manager.
      e. Name of Contractor.
      f. Date of video recording.
   2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
   3. At completion of training, submit complete training manual(s) for Owner's use prepared in same paper and PDF file format required for operation and maintenance manuals specified in Division 01 Section "Operation and Maintenance Data."

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
   1. Inspect and discuss locations and other facilities required for instruction.
   2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
   3. Review required content of instruction.
   4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.7 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.
      d. Regulatory requirements.
      e. Equipment function.
      f. Operating characteristics.
      g. Limiting conditions.
      h. Performance curves.
   2. Documentation: Review the following items in detail:
      a. Emergency manuals.

b. Systems and equipment operation manuals.
c. Systems and equipment maintenance manuals.
d. Product maintenance manuals.
e. Project Record Documents.
f. Identification systems.
g. Warranties and bonds.
h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.
5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning.
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

1.8 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operation and Maintenance Data."
B. Set up instructional equipment at instruction location.

1.9 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
    1. Owner will furnish Contractor with names and positions of participants.
C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
    1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.
D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.
E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
    1. At beginning of each training module, record each chart containing learning objective and lesson outline.
B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in full HD mode with vibration reduction technology.
    1. Submit video recordings on CD-ROM or thumb drive.
    2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
    3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
    4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:
        a. Name of Contractor/Installer.
        b. Business address.
        c. Business phone number.
        d. Point of contact.
        e. Email address.
C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.
    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
    1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

SECTION 02 41 19.13 - SELECTIVE DEMOLITION - ARCHITECTURAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Salvage of existing items to be reused.
B. Related Requirements:
   1. Division 01 Section "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
   2. Division 01 Section "Execution" for cutting and patching procedures.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in work of this Section.
B. Regulatory Requirements: Comply with applicable requirements of federal, state, and local laws, regulations, and codes having jurisdiction at project site or applicable requirements of these standards and specifications, whichever is more stringent.
C. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be salvaged or reinstalled.
B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.
   1. Coordinate ownership of demolition waste with Owner.
   2. Inspect and discuss condition of construction to be selectively demolished.
   3. Review structural load limitations of existing structure.
   4. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

5. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
6. Review areas where existing construction is to remain and requires protection.

1.6 SUBMITTALS

A. Engineering Survey: Submit engineering survey of condition of building.
B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
C. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.
E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.
G. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
E. Storage or sale of removed items or materials on-site is not permitted.
F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video.

3.2 PREPARATION

A. Protect benchmarks, monuments, and reference points from displacement or damage and, if displaced or damaged, replace at no cost to Owner.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
   1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least one hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:
1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. Maintain existing warranties.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.
1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.9 SELECTIVE DEMOLITION SCHEDULE

A. Refer to Drawings.

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, accessories, mixture design, placement procedures, and finishes.

1.2 RELATED SECTIONS

A. General Requirements – Division 01 All Sections
B. Section 31 20 00 "Earth Moving" for drainage fill under slabs-on-grade.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Design Mixtures: For each concrete mixture.
C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
D. Field quality-control test reports.
E. Material Certificates: For each of the following, signed by manufacturers:
    1. Cementitious materials.
    2. Admixtures.
    3. Form materials and form-release agents.
    4. Steel reinforcement and accessories.
    5. Fiber reinforcement.
    6. Waterstops.
    7. Curing compounds.
    8. Floor and slab treatments.
    9. Bonding agents.
    10. Adhesives.
    11. Vapor retarders.
    12. Semi-rigid joint filler.
    13. Joint-filler strips.
    14. Repair materials.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
    1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
    1. ACI 301, "Specification for Structural Concrete,"

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

C. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

PART 2 PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed except as noted otherwise on structural drawings.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

C. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following Cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I. Supplement with the following:
   a. Fly Ash: ASTM C 618, Class C.

B. Normal-Weight Aggregates: ASTM C 33, graded.

1. Maximum Coarse-Aggregate Size: 1 1/2 inch, unless noted otherwise.
2. Fine Aggregates: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Water Repellant: BASF Rheomix 235 per manufacturer's requirements

2.5 WATERSTOPS (Where indicated on Plans)

A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
   1. Profile: Ribbed with center bulb.
   2. Dimensions: 6 inches by 3/8 inch thick non-tapered.

B. Or Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

2.6 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class A, or polyethylene sheet, ASTM D 4397, not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.7 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Non-residual concrete curing compound.
   1. Products: Subject to compliance with requirements, provide the following to floor slabs-on-grade:
      a. L&M Construction Chemicals, Inc.; L&M Cure.

2.8 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
   1. Products: Subject to compliance with requirements, provide the following to floor slabs-on-grade: exposed concrete floors, not scheduled to be polished.
      a. L&M Construction Chemicals, Inc.; L&M Seal Hard.

2.9 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips:
   1. ASTM D 1751, asphalt-saturated cellulosic fiber.

2.10 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
B. Aggregates shall be proportioned such that mix design contains a minimum of 50 percent coarse aggregate per the gradation requirement of ASTM C33.
C. Minimum Cementitious Materials: 470 pounds per cubic yard, unless indicated otherwise.
D. Cementitious Materials: A maximum of 20 percent of fly ash (by weight) may be used to reduce the total amount of portland cement, which would otherwise be used.
E. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
      a. Pumped concrete slump limit: 7 inches for concrete with verified slump, as indicated below, before adding high range water-reducing admixture or plasticizing admixture, plus or minus 1 inch. Concrete shall have the same or lower water-cement ratio and does not exhibit segregation potential or excessive bleeding.
F. Proportion normal-weight concrete mixture as follows:
   1. Slab-on-grade:
      a. Minimum Compressive Strength: 3,500 psi at 28 days
      b. Maximum Water-Cementitious Materials Ratio: 0.475
      c. Slump Limit: 4 inches, plus or minus 1 inch.
      d. Maximum Nominal Aggregate Size: 1 inch
      e. Fly Ash Supplement Allowed: Yes
      f. Air Entrained: None, maximum 3 percent at point of delivery
      g. Provide water repellant per manufacturer's recommendations.

   2. Exterior porch slab-on-grade:
      a. Minimum Compressive Strength: 3,500 psi at 28 days
      b. Maximum Water-Cementitious Materials Ratio: 0.45
      c. Slump Limit: 4 inches, plus or minus 1 inch.
      d. Maximum Nominal Aggregate Size: 1 inch
      e. Fly Ash Supplement Allowed: Yes
      f. Air Entrained: 4.5 percent, plus or minus 1.5 percent at point of delivery

   3. Footings:
      a. Minimum Compressive Strength: 3,000 psi at 28 days
      b. Maximum Water-Cementitious Materials Ratio: 0.53

c. Slump Limit: 5 inches, plus or minus 1 inch.
d. Maximum Nominal Aggregate Size: 1-1/2 inch
e. Minimum Cementitious Materials: 470 pounds per cubic foot
f. Fly Ash Supplement Allowed: Yes
g. Air Entrained: 4.5 percent, plus or minus 1.5 percent at point of delivery

4. Stem Walls & Pedestals:
   a. Minimum Compressive Strength: 3,500 psi at 28 days
   b. Maximum Water-Cementitious Materials Ratio: 0.475
   c. Slump Limit: 5 inches, plus or minus 1 inch.
   d. Maximum Nominal Aggregate Size: 1-1/2 inch
   e. Fly Ash Supplement Allowed: Yes
   f. Air Entrained: 4.5 percent, plus or minus 1.5 percent at point of delivery

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 CONCRETE MIXING

A. No water shall be added to the truck after the water leaves the mixing plant.
B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 FORMWORK

A. Refer to ACI347-68 "Recommended Practice for Concrete Formwork."
B. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
D. Chamfer exterior corners and edges of permanently exposed concrete.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.03 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
   1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement & meet the requirements of ACI318-14, "Building Code Requirements for Reinforced Concrete."
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
   1. Weld reinforcing bars according to AWS D1.4, where indicated.
D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.05 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groove tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.06 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect

exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Or Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.07 CONCRETE PLACEMENT

A. No water shall be added to the concrete after the truck leaves the mixing plant.

B. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

D. Cold-Weather Placement: Comply with ACI 306.1.

E. Do not place concrete on frozen material.

F. Freeze protection shall be provided if temperature may drop below 35 degrees for a duration of 72 hours after placement.

G. Hot-Weather Placement: Comply with ACI 301.

3.08 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:

1. Exposed to View and Foot Traffic: F(F) of 25; F(L) of 15.
2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
4. Under Resilient Athletic Flooring: F(F) of 45; F(L) of 35.
5. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.

B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.09 FINISHING FORMED SURFACES

A. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. All exposed concrete locations.
2. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until

producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.010 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
   1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings to receive mortar setting beds for bonded Cementitious floor finishes

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
   2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4 inch, unless noted otherwise in "Floor Flatness Levelness Tolerances" Section.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to interior parking slab on grade, exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and

during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
      a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
   4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than three days' old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

3.13 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:
   1. Verification of use of required design mixture.

2. Concrete placement, including conveying and depositing.
3. Curing procedures and maintenance of curing temperature.
4. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency:
   a. Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. but less than 25 cu. yd. plus one set for each additional 50 cu. yd. or fraction thereof.
      1) When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump:
   a. ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content:
   a. ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature:
   a. ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens:
   a. ASTM C 31/C 31M.
      1) Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
      2) Cast and field cure one set of two standard cylinder specimens for each composite sample during cold weather concreting.
6. Compressive-Strength Tests:
   a. ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
      1) Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
      2) A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi

9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing:
    a. Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:
    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

3.15 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03 30 00

SECTION 03 35 00 - CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Concrete sealer.
B. Related Sections include the following:
   1. Division 03 "Cast-in-Place Concrete."

1.3 SUBMITTALS

A. Per Division 01, Section “Submittal Proceedures”.
B. Product Data: For each type of product indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Delivery materials to Project site n manufacturer’s original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
B. Storage: Store materials in clean, dry area in accordance with manufacturer’s instructions. Keep containers sealed until ready for use. Keep from freezing.
C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not apply sealer when concrete or air temperatures are below 40 deg F.

1.6 QUALITY ASSURANCE

A. Mockup: Prepare a mockup of each color of stain not less than 4 by 4 feet in locations directed by Architect to confirm color selections made in Finish Legend, and demonstrate approved methods of application and results. Protect approved work during construction. Mockups which are undamaged at time of Substantial Completion may be incorporated into the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Concrete Sealer:
   1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Sherwin Williams “Armorseal 8100 Series”.
   2. Color: Clear

2.2 PRODUCTS

A. Waterborne acrylic coating appropriate for interior use.
B. Must meet ADA requirements for slip resistance.
   1. Provide manufacturer's recommended slip resistant additive.
C. Uniform glossy appearance.
E. Number of coats is to be as recommended by manufacturer with a minimum of 2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive concrete sealers and stains. Surfaces must be free of standing water, and clean and dry. Notify Architect if surfaces are not acceptable.
   1. Begin surface preparations only after unsatisfactory conditions have been corrected. Beginning of installation means acceptance of existing substrate and conditions.

3.2 SURFACE PREPARATION

A. Prepare concrete surfaces in accordance with manufacturer's written recommendations and instructions.
B. New Concrete: Cure concrete in accordance with manufacturer's instructions, and as specified in Division 03 Section "Cast-In-Place Concrete."
C. Existing Cured or Aged Concrete: Should contractor elect to let concrete cure and delay installation of concrete treatments, ensure surfaces are clean, dry, and free of coatings and contaminants.
   1. Thoroughly clean aged concrete by pressure washing with strong alkaline detergent to remove dirt, waxes, oils, and similar buildup.

3.3 APPLICATION

A. Sealers:
   1. Apply concrete sealers to concrete surfaces in accordance with manufacturer's written instructions.
   2 Uniformly apply a continuous sealing compound to concrete, either hardened or untreated, by power spray or roller according to manufacturer's written recommendations.

3.4 PROTECTION

A. Protect horizontal surfaces from traffic and incidental damage until treatments have cured.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Miscellaneous framing and supports.
   2. Shelf angles.
   3. Metal ladders.
   4. Miscellaneous steel trim.
   5. Metal bollards.
   6. Pipe and downspout guards.
   7. Metal downspout boots.
   8. Loose bearing and leveling plates.

B. Products furnished, but not installed, under this Section include the following:
   1. Loose steel lintels.
   2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
   3. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Requirements:
   1. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
   2. Division 05 Section "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.
   3. Division 09 Section "Paints and Coating" for finishing of metal items.

1.2 COORDINATION

A. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 SUBMITTALS

A. Product Data: For the following:
   1. Fasteners.
   2. Shop primers.
   3. Shrinkage-resisting grout.
   4. Manufactured metal ladders.
   5. Metal bollards.
   6. Pipe and downspout guards.
   7. Metal downspout boots.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
   1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.

2. Shelf angles.
3. Metal ladders.
4. Metal floor plate and supports.
5. Metal bollards.
6. Loose steel lintels.

C. Delegated Design Submittals: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Certificates:
1. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.
2. Welding certificates.

E. Research Reports: For post-installed anchors.

F. Delegated design engineer qualifications.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.5 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls, floor slabs, decks, and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Stainless Steel Sheet, Strip, and Plate: ASTM A240/A240M or ASTM A666, Type 304.

D. Stainless Steel Bars and Shapes: ASTM A276/A276M, Type 304.

E. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.

F. Rolled-Stainless Steel Floor Plate: ASTM A793.

G. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.

H. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

I. Stainless Steel Wire Rope: Wire rope manufactured from stainless steel wire complying with ASTM A492, Type 316.
   1. Wire Rope Fittings: Stainless steel connectors, Type 316, with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

J. Steel Prestressing Strand: ASTM A416/A416M, Grade 270 (Grade 1860), low-relaxation, seven-wire, with 0.9-lb/sq. ft. (4.39-kg/sq. m) zinc coating.
   1. Steel Prestressing Strand Fittings: Hot-dip galvanized-steel anchors and connectors with capability to sustain, without failure, a load equal to minimum breaking strength of steel prestressing strand with which they are used.

K. Aluminum Plate and Sheet: ASTM B209 (ASTM B209M), Alloy 6061-T6.

L. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063-T6.

M. Aluminum-Alloy Rolled Tread Plate: ASTM B632/B632M, Alloy 6061-T6.

N. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
   1. Provide stainless steel fasteners for fastening aluminum or stainless steel.
   2. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ISO 898-1, Property Class 4.6); with hex nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.

C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, (ASTM A563M, Class 10S3) heavy-hex carbon-steel nuts; and where indicated, flat washers.

D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593 (ISO 3506-1); with hex nuts, ASTM F594 (ASTM F836M); and, where indicated, flat washers; Alloy Group 1 (A1).

E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563 (ASTM A563M); and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
   2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless steel bolts, ASTM F593 (ISO 3506-1), and nuts, ASTM F594 (ASTM F836M).

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Division 09 Section “Painting”.
B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
   1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
C. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
D. Concrete: Comply with requirements in Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
D. Form exposed work with accurate angles and surfaces and straight edges.
E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.
   1. Provide mitered and welded units at corners.
   2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.
B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
C. Galvanize and prime shelf angles located in exterior walls.
D. Prime shelf angles located in exterior walls with zinc-rich primer.
E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. Steel Ladders:
   1. Space siderails 18 inches (457 mm) apart unless otherwise indicated.
   2. Siderails: Continuous, 1/2-by-2-1/2-inch (12.7-by-64-mm) steel flat bars, with eased edges.
   3. Rungs: 1-inch- (25-mm-) square, steel bars.
   4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
   5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
   6. Source Limitations: Obtain nonslip surfaces from single source from single manufacturer.
   7. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
   8. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
   9. Galvanize and primeladders, including brackets.
   10. Primeladders, including brackets and fasteners, with zinc-rich primer.

2.9 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 80 steel pipe 1/4-inch (6.4-mm) wall-thickness rectangular steel tubing.
   1. Cap bollards with 1/4-inch- (6.4-mm-) thick, steel plate with [**domed**] top.
B. Fabricate sleeves for bollard anchorage from steel or stainless steel tubing with 1/4-inch- (6.4-mm-) thick, steel or stainless steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard.
C. Prime steel bollards with zinc-rich primer.

2.10 PIPE AND DOWNSPOUT GUARDS

A. Fabricate downspout guards from 3/8-inch- (9.5-mm-) thick by 12-inch- (300-mm-) wide, steel plate, bent to fit flat against the wall or column at both ends and to fit around pipe with 2-inch (50-mm) clearance between pipe and pipe guard. Drill each end for two 3/4-inch (19-mm) anchor bolts.
B. Galvanize and prime steel downspout guards.
C. Prime steel downspout guards with zinc-rich primer.

2.11 METAL DOWNSPOUT BOOTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. J.R. Hoe & Sons Inc.
   2. Neenah Foundry Company.
B. Source Limitations: Obtain downspout boots from single source from single manufacturer.
C. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.
   1. Outlet: At 35 degrees from horizontal, to discharge onto splash block or pavement.
D. Prime cast-iron downspout boots with zinc-rich primer.

2.12 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
B. Galvanize bearing and leveling plates.
C. Prime plates with zinc-rich primer.

2.13 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
B. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.
C. Galvanize and prime loose steel lintels located in exterior walls.
D. Prime loose steel lintels located in exterior walls with zinc-rich primer.

2.14 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.15 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.
B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.16 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
   1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
   1. Shop prime with primers specified in Division 09 Section "Painting" unless indicated.
D. Preparation for Shop Priming: Prepare surfaces to comply with primer's manufacturer's instructions.
E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
   1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.17 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.

2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
B. Anchor shelf angles securely to existing construction with anchor bolts.

3.3 INSTALLATION OF SHELF ANGLES

A. Install shelf angles as required to keep masonry level, at correct elevation, and flush with vertical plane.

3.4 INSTALLATION OF METAL LADDERS

A. Secure ladders to adjacent construction with the clip angles attached to the stringer.
B. Install brackets as required for securing of ladders welded or bolted to structural steel or built into masonry or concrete.

3.5 INSTALLATION OF METAL BOLLARDS

A. Fill metal-capped bollards solidly with concrete and allow concrete to cure seven days before installing.
B. Anchor bollards in concrete. Fill annular space around bollard solidly with shrinkage-resistant grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.
C. Fill bollards solidly with concrete, mounding top surface to shed water.
1. Do not fill removable bollards with concrete.

3.6 INSTALLATION OF PIPE AND DOWNSPOUT GUARDS

A. Provide pipe guards at exposed vertical pipes in at locations indicated on Drawings where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each pipe guard. Mount pipe guards with top edge 26 inches (660 mm) above driving surface.

3.7 INSTALLATION OF METAL DOWNSPOUT BOOTS

A. Anchor metal downspout boots to concrete or masonry construction to comply with manufacturer's written instructions.
B. Secure downspouts terminations to downspouts and substrate per manufacturer's instructions.

3.8 INSTALLATION OF LOOSE BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.9 REPAIRS

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Wood products.
   2. Wood-preservative-treated lumber.
   3. Fire-retardant-treated lumber.
   4. Dimension lumber framing.
   5. Miscellaneous lumber.
   6. Plywood backing panels.

B. Related Requirements:
   1. Division 06 Section "Sheathing" for sheathing, subflooring, and underlayment.
   2. Division 31 Section "Termite Control" for site application of borate treatment to wood framing.

1.2 DEFINITIONS

A. Boards or Strips: Lumber of less than 2 inches nominal (38 mm actual) size in least dimension.

B. Lumber grading agencies, and abbreviations used to reference them, include the following:
   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NLGA: National Lumber Grades Authority.
   3. SPIB: The Southern Pine Inspection Bureau.
   4. WCLIB: West Coast Lumber Inspection Bureau.
   5. WWPA: Western Wood Products Association.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
   3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.
   4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Material Certificates:
   1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire retardant treated material, an inspection agency acceptable to authorities having jurisdiction.
B. Perform Work in accordance with the following agencies:
   1. Lumber Grading Agency: Certified by ALSC. ALSC - American Lumber Standards Committee: Softwood Lumber Standards.
   2. Plywood Grading Agency: Certified by APA. APA: American Plywood Association.
   3. AWPA (American Wood Preservers Association) C20 - Structural Lumber Fire Retardant Treatment by Pressure Process.
   4. SPIB: Southern Pine Inspection Bureau.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
   3. Dress lumber, S4S, unless otherwise indicated.
B. Maximum Moisture Content:
   1. Boards: 19 percent.
   2. Dimension Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1, Use categories as follows:
   1. UC2: Interior construction not in contact with ground but may be subject to moisture. Include all rough carpentry the following items:
      a. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
      b. Wood millwork.
   2. UC3A (Commodity Specification A): Coated sawn products in exterior construction not in contact with ground but exposed to all weather cycles including intermittent wetting. Include the following items:
      a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   3. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

4. After treatment, redry boards to 19 percent maximum moisture content.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED LUMBER

A. Application: Treat all rough carpentry unless otherwise indicated.

B. General: Where fire-retardant-treated materials are indicated, materials are to comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

C. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.
   1. Treatment is not to promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials are to comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering in accordance with ASTM D2898. Use for exterior locations and where indicated.
   3. Design Value Adjustment Factors: Treated lumber is to be tested according to ASTM D5664 and design value adjustment factors are to be calculated according to ASTM D6841.

D. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.

E. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency and other information required by authorities having jurisdiction.

2.4 MISCELLANEOUS LUMBER

A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Rooftop equipment bases and support curbs.
   4. Cants.
   5. Furring.
   6. Grounds.

B. Concealed Boards: 19 percent maximum moisture content andthe following species and grades:
   1. Fir or Southern Yellow Pine.
   2. Lumber Grading: SPIB.

C. Roofing Nailers: Structural- or No. 2-grade lumber or better; kiln-dried Douglas fir, southern pine, or wood having similar decay-resistant properties.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch (13-mm) nominal thickness.

2.6 FASTENERS

A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
   1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329.
B. Nails, Brads, and Staples: ASTM F1667.
C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches (406 mm) o.c.
E. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches (2438 mm) o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron.
H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
   2. ICC-ES evaluation report for fastener.
J. Securely attach roofing nailers to substrates by anchoring and fastening to withstand bending, shear, or other stresses imparted by Project wind loads and fastener-resistance loads as designed in accordance with ASCE/SEI 7.
K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
C. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Plastic laminate cabinets.
   2. Plastic laminate countertops.
   3. Solid surfacing material.

B. Related Sections include the following:
   1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

A. Per Division 01 section “Submittal Procedures”.

B. Product Data: For high pressure decorative laminate, adhesive for bonding plastic laminate, solid surfacing material, cabinet hardware and accessories, and finishing materials and processes.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, and other items installed in architectural woodwork.
   4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

D. Samples for Initial Selection:
   1. Shop applied transparent finishes.
   2. Plastic laminates.
   3. PVC edge material.
   4. Solid surfacing materials.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Woodwork Quality Standard Compliance: Must meet AWI Quality Certification Program standards. Certificate not required.

G. Qualification Data: For Installer and fabricator.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in service performance. Shop demonstrates it meets quality requirements of AWI's Quality Certification Program.
B. Installer Qualifications: Installer demonstrates he meets quality requirements of AWI's Quality Certification Program.
C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence matched wood veneers.
D. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.
    1. Provide written warranty/certificate indicating that woodwork, including installation, complies with requirements of grades specified.
E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
F. Pre-installation Conference: Conduct conference at Project site. Per Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
B. Wood Products: Comply with the following:
    1. No particle board on this project.
    2. Hardboard: AHA A135.4.

3. Medium Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
4. Softwood Plywood: DOC PS 1, Medium Density Overlay.

C. High Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
1. Manufacturer: Subject to compliance with requirements, provide high pressure decorative laminates by one of the following:
   a. Formica Corporation.
   b. Wilsonart International; Div. of Premark International, Inc.
2. Colors and Patterns: As selected by Architect from manufacturer's full range.

D. Solid Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Formica Corporation. Basis of Design.
   b. Wilsonart International; Div. of Premark International, Inc.
   c. Corain, DuPont.

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."

B. Posts for glass- CR Laurence Display System 1.25” diameter aluminum post.

C. **Metal or Plastic Drawer Sides are not accepted.**

D. Adjustable Shelfs to have either of the below:
1. Borings with shelf support pins
   a. Hafele Plastic Shelf Support, Heavy Duty, 2 mm.
2. Standards and Rails: Knape and Vogt Models 255 and 256.
3. Heavy Duty Adjustable Shelf Standards and Brackets:
   a. Basis of Design: Knape and Vogt 87 Series Oversized Standard and 187 Series Bracket System.
   b. Standards Dimension: 7/8” wide x 11/16” deep x length as shown on drawings. Includes 1” adjustment brackets.
   c. Standards Minimum Thickness: 12 gauge.
   d. Bracket Size: 12- inch.
   e. Bracket Minimum Thickness: 12 gauge.
   f. Color: Anochrome.

E. Display Cabinet
1. Display Cabinet Shelf Standards and Brackets:
   a. Basis of Design: Rakks
   b. Brackets: Rakks Style Model: BR-016.
   c. Standards Model: C Standard - Surface Mounted.
   d. Finish: Clear Anodized.
   e. Accessories:
      1) Shelf Coupler.
      2) Shelf Rests.
2. Display Cabinet Sliding Glass Accessories:
   a. Adjustable Ratchet Lock: Knape and Vogt 962 Series.
   b. Rol- Ezy Ball Bearing Track System: P992 Large Glass Door Kit. Provide all items needed for a fully functioning sliding door system.
3. Aluminum Slides for Sliding Glass Doors: BHMA A156.9, B07063.

F. Frameless Concealed Hinges (European Type): BHMA A156.9, Grade 1, B01602, 120 to170 degrees of opening, self-closing.
G. Large Door Hinges for use on large teacher cabinet doors: Grass Tiomos 95degree.
H. Back Mounted Pulls: BHMA A156.9, B02011.
I. Wire Pulls: Back mounted, solid metal 4 or 5 inches long, 2-1/2 inches deep, and 5/16 inch in diameter.
J. Catches: Magnetic catches, BHMA A156.9, B03141.
K. Drawer Slides: BHMA A156.9, B05091.
    1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full extension type; zinc plated steel ball bearing slides.
    2. Box Drawer Slides: Grade 1HD-100; for drawers not more than 6 inches high and 24 inches wide.
    3. File Drawer Slides: Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
    4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
    5. Keyboard Slides: Grade 1HD-100; for computer keyboard shelves.
    6. Trash Bin Slides: Grade 1HD-200; for trash bins not more than 20 inches high and 16 inches wide.
L. Heavy Duty Steel Shelf Bracket:
    1. Basis of Design: Rockler Model 49586.
    2. Size: 12- inch x 18- inch.
    3. Minimum Load Rating: 1,000 lbs per bracket.
    4. Minimum Steel Thickness: 1/8- inch.
    5. Color: Black.
M. Door Locks: BHMA A156.11, E07121.
    1. All teacher cabinets to have locks.
N. Drawer Locks: BHMA A156.11, E07041.
O. Coat / Wardrobe Hooks: Ives 582.
P. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated, as selected in advance by architect.
    1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
    2. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
    3. Satin Stainless Steel: BHMA 630.
Q. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium grade interior woodwork complying with referenced quality standard.
B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
    1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.

2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

E. Shop cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

F. Install glass to comply with applicable requirements in Division 08 Section "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.4 PLASTIC-LAMINATE CABINETS

A. Grade: Premium.

B. **Euro- Style / frameless Cabinetry is acceptable. Standards and Rails are still to be used.**

C. **AWI Type of Cabinet Construction and As Indicated.**

D. Reveal Dimension: As indicated.

E. Laminate Cladding for Exposed Surfaces: High pressure decorative laminate complying with the following requirements:
   1. Horizontal Surfaces Other Than Tops: Grade HGS.
   2. Post formed Surfaces: Grade HGP.
   3. Vertical Surfaces: Grade HGS.
   4. Edges: Grade HGS.
   5. Door and Drawer Backs: Grade HGS, the same laminate as the front door and drawer.

F. Materials for Semi exposed Surfaces:
   1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
      a. Edges of Plastic Laminate Shelves: PVC edge banding, 0.12 inch thick, matching laminate in color, pattern, and finish.
      b. For semi exposed backs of panels with exposed plastic laminate surfaces, provide surface of high pressure decorative laminate, Grade VGS.
   2. Drawer Sides and Backs: Solid hardwood lumber.
   3. Drawer Bottoms: Hardwood plywood.

G. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High pressure decorative laminate, Grade BKL.

H. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As selected by Architect from laminate manufacturer's full range.

I. Provide dust panels of 1/4 inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

J. Edges of Plastic Laminate Clad Doors, Drawer Fronts, Shelves: PVC tape, 3-mm thickness, matching laminate in color, pattern, and finish. Doellken-Woodtape PVC Edgebanding.

2.5 PLASTIC LAMINATE COUNTERTOPS

A. Grade: Premium.

B. High Pressure Decorative Laminate Grade: HGS.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As selected by Architect from manufacturer's full range.

D. Grain Direction: Parallel to cabinet fronts.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: Exterior grade plywood.

G. Core Material at Sinks: exterior grade plywood.

H. Backer Sheet: Provide plastic laminate backer sheet, Grade BKL, on underside of countertop substrate.
I. Paper Backing: Provide paper backing on underside of countertop substrate.

2.6 SOLID SURFACING MATERIALS

A. Grade: Premium.
B. Solid Surfacing Material Thickness: 1/2- inch.
C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid surfacing material complying with the following requirements:
   1. As selected by Architect from manufacturer's full range.
D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid surfacing material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
   1. Fabricate tops with shop applied edges of materials and configuration indicated.
   2. Fabricate tops with shop applied backsplashes as indicated on drawings.
E. Install integral sink bowls in countertops in shop.
F. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

2.7 MISCELLANEOUS MATERIALS

A. Glue: Aliphatic resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
B. Fasteners for Interior Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
C. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.8 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.
B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
   1. Back priming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end grain surfaces. Concealed surfaces of plastic laminate clad woodwork do not require back priming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
B. Before installing architectural woodwork, examine shop fabricated work for completion and complete work as required, including removal of packing and back priming.
C. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Beginning of Installation means acceptance of existing substrate and conditions.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.
D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
    1. Install cabinets with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
    2. Maintain veneer sequence matching of cabinets with transparent finish.
    3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with one of the following:
        a. No. 10 wafer-head screws sized for 1 inch penetration into wood framing, blocking, or hanging strips.
        b. No. 10 wafer head sheet metal screws through metal backing or metal framing behind wall finish.
        c. Toggle bolts through metal backing or metal framing behind wall finish.
G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
    1. Align adjacent solid surfacing material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
    2. Install countertops with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
    3. Secure backsplashes to walls with adhesive.
    4. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
B. Clean, lubricate, and adjust hardware.
C. Clean woodwork on exposed and semi exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 06 64 00 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Factory-laminated plastic sheet paneling. Glass-Fiber-Reinforced Plastic (FRP) Paneling.

B. Related Requirements:
   1. Division 06 Section "Rough Carpentry" for wood furring for installing plastic paneling.
   2. Division 10 Section "Wall and Door Protection" for corner guards installed over plastic paneling.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.3 QUALITY ASSURANCE

A. Testing Agency: Acceptable to authorities having jurisdiction.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING

A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D5319.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Marlite.
   2. Surface-Burning Characteristics: As follows when tested by a qualified testing agency in accordance with ASTM E84. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.
   3. Glass-Fiber-Reinforced Plastic Panel Nominal Thickness: Not less than 0.09 inch (2.3 mm).
   4. Surface Finish: Molded pebble texture.
   5. Color: As selected by Architect from manufacturer's full range.

B. Mop sinks; 4- foot tall by the width of mop sink on walls at all mop sinks.

1. Basis-of-Design Product: Subject to compliance with requirements, provide **Marlite Product Standard FRP.**
2. Color: As selected by Architect from manufacturer's standard range.

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.
   1. Color: Match panels.

B. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

C. Adhesive: As recommended by plastic paneling manufacturer.

D. Sealant: Manufacturer’s brand- Color match Sealant.
   1. Install at joints between panels to create continuous pattern.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

B. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

C. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

D. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels and so that trimmed panels at corners are not less than 12 inches (300 mm) wide.
   1. Mark plumb lines on substrate at trim accessory and panel joint locations for accurate installation.
   2. Locate trim accessories and panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.
   1. Drill oversized fastener holes in panels and center fasteners in holes.
   2. Apply sealant to fastener holes before installing fasteners.

D. Install trim accessories with adhesive and nails or staples as required by FRP Manufacturer. Do not fasten through panels.

E. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.

F. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

G. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

3.4 PROTECTION

A. Protect partially completed and complete FRP against damage from other construction traffic when work is in progress.

END OF SECTION

SECTION 07 13 00 - UNDER-SLAB VAPOR BARRIER

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Products supplied under this section:
   1. Vapor barrier and installation accessories for installation under concrete slabs.
B. Related sections:
   1. Division 03 Section “Structural Concrete.”

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E1745- 11Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E154- 08 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
   3. ASTM F1249-06 (2011)Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
   4. ASTM D882-10 Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
   5. ASTM D1709-09 Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
   6. ASTM E1643- 11Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
B. American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.4 SUBMITTALS

A. Product Data including the following Quality control/assurance items:
   1. Summary of test results per paragraph 8.3 of ASTM E 1745.
   2. Manufacturer’s samples and literature.
   3. Manufacturer’s installation instructions for placement, seaming and penetration repair instructions.
   4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.

1.5 QUALITY ASSURANCE

A. Source Limitations: All system components are to be from one single vapor barrier manufacturer from single source from single manufacturer and from sources approved by vapor barrier manufacturer as compatible with system components.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Vapor barrier shall have all of the following qualities:
   1. Maintain permeance of less than 0.01 Perms [grains/(ft^2 · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
   2. Puncture resistance of 2200g or greater per ASTM D 1709, B.
   3. Other performance criteria:
      a. Strength: ASTM E1745 Class A.
      b. Thickness: 15 mils minimum
   4. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1

B. Vapor barrier products:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide **Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC** or comparable product by one of the following:
      a. Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC. - Basis of Design
      b. W. R. Meadows.
      c. Vaporguard, 15 mils by Reef Industries, 713-507-4250. www.reefindustries.com.
      d. Moistop Ultra 15 by Fortifiber, 800-773-4777. www.fortifiber.com.
      e. Vapor Block 15; Raven Industries Inc.
      f. Moistop Ultra 15; Fortifiber Corporation.
      g. No substitutions.

C. Install vapor barrier in accordance with ASTM E1643-11
   1. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the slab itself using manufacturer's recommended product, and per manufacturer's instructions.

D. Contact the Manufacturer's representative to coordinate a review of the vapor barrier installation either by digital review or in person.
   1. Schedule with enough time to perform corrective actions before concrete is installed.
   2. Provide report of this review to Architect.
   3. Perform corrective actions noted in report before concrete is installed.

2.2 ACCESSORIES

A. Seams :
   1. Stego Tape by Stego Industries LLC, www.stegoindustries.com.

B. Penetrations of Vapor barrier:
   1. Stego Mastic by Stego Industries LLC, www.stegoindustries.com.
   2. Stego Tape by Stego Industries LLC, www.stegoindustries.com.

C. Perimeter/edge seal:
   1. Stego Crete Claw by Stego Industries LLC, www.stegoindustries.com.
   2. Stego Term Bar by Stego Industries LLC, www.stegoindustries.com.

3. StegoTack Double-Sided Tape by Stego Industries LLC, www.stegoindustries.com.

PART 3 – EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
   1. Level and compact base material.

3.2 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643-11 and per manufacturer's instructions.
   1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
   2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise
      (a) at a point acceptable to the structural engineer or
      (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the slab itself with manufacturer's recommended product, and per manufacturer's instructions.
   3a. Seal vapor barrier to slab perimeter/edge using Stego Crete Claw and remove dirt, debris, and mud from Crete Claw prior to concrete placement.

   OR

   3b. Seal vapor barrier to footing/grade beam with double sided tape, termination bar, or both.
   4. Overlap joints 6 inches and seal with manufacturer's tape.
   5. Apply tape/Crete Claw to a clean and dry vapor barrier.
   6. Seal all penetrations (including pipes) per manufacturer's instructions.
   7. For interior forming applications, avoid the use of non-permanent stakes driven through the vapor barrier. Use female-threaded screed pad posts with nail holes and insert them into Beast Foot. Ensure Beast Foot's peel-and-stick adhesive base is fully adhered to the vapor barrier.
   8. If non-permanent stakes must be driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
   9. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.
   10. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
   11. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.
   12. For vapor barrier-safe concrete screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer's instructions prior to placing concrete.

END OF SECTION

SECTION 072100 – THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. **Not every insulation included in this specification section is used in this project. Refer to Drawings for uses, types and locations.**
B. Section Includes:
   1. Perimeter Insulation/ Foundation wall insulation and Insulation under slabs on grade.
   2. Cavity Wall.
   3. Unfaced Batt Insulation.
   4. Faced Batt Insulation.
   5. Unfaced Mineral Insulation.
   6. Faced Mineral Insulation: Faced, mineral-wool blanket insulation.
C. Related Sections:
   1. Roof insulation is specified in the Division 07 Section in which other roofing products, including roofing membrane is covered.
   2. Foam plastic board insulation for exterior insulation and finish systems is specified in another Division 07 Section.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
C. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 QUALITY ASSURANCE

A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.
B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Surface Burning Characteristics: ASTM E 84.
   2. Fire Resistance Ratings: ASTM E 119.
   3. Combustion Characteristics: ASTM E 136.
C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
B. Protect foam-plastic board insulation as follows:
   1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
   3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION SCHEDULE

A. **Not every insulation included in this specification section is used in this project. Refer to Drawings for uses, types and locations.**
B. Perimeter Insulation/ Foundation wall insulation and Insulation under slabs on grade: Type IV extruded-polystyrene board (XPS) insulation.
C. Cavity Wall: Type I molded-polystyrene board (EPS) insulation.
D. Incidental use insulation:
   1. Unfaced Batt Insulation: Unfaced, glass-fiber blanket insulation.
   2. Faced Batt Insulation: Faced, glass-fiber blanket insulation.
   3. Unfaced Mineral Insulation: Unfaced, mineral-wool blanket insulation.
   4. Faced Mineral Insulation: Faced, mineral-wool blanket insulation.

2.2 FOAM-PLASTIC BOARD INSULATION

A. Perimeter/ Slab Insulation. Extruded-Polystyrene Board Insulation (XPS): ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. DiversiFoam Products.
      b. Dow Chemical Company (The).
      c. Owens Corning.
      d. Pactiv Building Products.
   2. Type IV, 25 psi (173 kPa).
B. Wall Cavity. Molded-Polystyrene Board Insulation (EPS): ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. DiversiFoam Products.
      b. Plymouth Foam, Inc.
   2. Type I, 10 psi (69 kPa).
C. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
   1. Seal insulation boards with spray foam or tape (manufacturer recommended) at every butt joint, penetrations, and cracks for the entire cavity wall, typical.

2.3 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CertainTeed Corporation.
   2. Guardian Building Products, Inc.
   3. Johns Manville.
   4. Knauf Insulation.
   5. Owens Corning.
B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
C. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).

2.4 UNFACED MINERAL INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Fibrex Insulations Inc.
   2. Owens Corning.
   3. Roxul Inc.
   4. Thermafiber.
B. Unfaced, Mineral-Wool
C. Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.5 INSULATION FASTENERS

A. Mechanical Anchors: Type and size indicated or, if not indicated, as recommended by insulation manufacturer for type of application and condition of substrate.
B. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with requirements for fire performance characteristics.
C. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.
D. Protection Board: Pre-molded, semi rigid asphalt/fiber composition board, 1/4" thick, formed under heat and pressure, standard sizes.
E. Eave Ventilation Troughs: Preformed rigid fiberboard or plastic sheet designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.
F. Crack Sealer for Board Insulation: Provide polymeric insulating foam in aerosol dispenser designed for filling voids in board insulation.
   1. Product: Subject to compliance with requirements, provide "Polycel 100" by Construction Products Div., W.R. Grace & Co.

PART 3 - EXECUTION

3.1 PREPARATION

A. Require Installer to examine substrates and conditions under which insulation work is to be performed. A satisfactory substrate is one that complies with requirements of the section in which

substrate and related work is specified. Obtain Installer's written report listing conditions detrimental to performance of work in this section. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected. Beginning of installation means acceptance of existing substrate and site conditions.

B. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and **fill voids with insulation.** Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04 Section "Unit Masonry."

2. Create a continuous insulation barrier. Seal cavity insulation boards with spray foam insulation typical at all butt joints and cracks to create a continuous insulation barrier. Fill any holes with insulation.

3.5 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
   2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
   4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.6 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation 48 inches (1219 mm) up either side of partitions.

3.7 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
   1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
   2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
   3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
   4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.8 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07 21 30 - PRE- ENGINEERED BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification Sections, apply to work specified in this section.

1.2 DEFINITIONS

A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in, or construction joints between, fire rated wall and floor assemblies.

1.3 SECTION INCLUDES

A. Pre-Engineered Building Insulation for New Construction.

1.4 RELATED WORK OF OTHER SECTIONS

A. Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
   1. Division 13 Section “Pre-Engineered Metal Buildings”
   2. Division 22 Section “Plumbing and Piping-General”
   3. Division 23 Section “Basic Methods and Requirements (Mechanical)”
   4. Division 26 Section “General Electrical Requirements”

1.5 REFERENCES

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
B. ASTM E 96 - Standard Test Method for Water Vapor Transmission of Materials in Sheet Form (Procedure B).
C. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
D. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
E. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
F. ASTM C 1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

1.6 DESIGN REQUIREMENTS

A. Thermal Resistance of Installed System: R-Value of R-30 minimum.
B. Insulating system shall have a continuous vapor barrier inside of building purlins, girts, and insulation to provide complete isolation from inside conditioned air.

1.7 SUBMITTALS

A. Provisions of Division 01 Section “Submittal Procedures” apply to this Section.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.
3. Installation instructions.

C. Shop Drawings: Indicate locations of connections and attachments, general details, anchorages and method of anchorage and installation.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square or long, representing actual products required for this project.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing product systems specified in this section with minimum five years documented experience.

B. Installer Qualifications: Company specializing in performing work of this section and certified by system manufacturer for installation of product.

C. Insulation system components to include a ten-year limited material warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials undamaged in manufacturer's clearly labeled, unopened containers.

B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

C. Store materials indoors and protect from weather, construction traffic and damage in compliance with manufacturer's requirements, including temperature restrictions.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: Thermal Design, Inc., Simple Saver System. P.O. Box 468, 601 N. Main Street, Madison, NE 68748. ASD. Tel: (800) 255-0776 or (402) 454-6591. Fax: (402) 454-2708. Email: sales@thermaldesign.com, www.thermaldesign.com. Subject to compliance with requirements, provide products by one of the following:
1. Simple Saver System
2. Owens Corning.

B. Substitutions: Under provisions of Division 01 Section “Substitution Procedures”.

2.2 MATERIALS

A. Full-Depth Fabric Lined Insulation System consists of Batt Insulation, Roof Insulation, Wall Insulation, Vapor Barrier Liner Fabric, Thermal Breaks, Straps, and other devices and components as follows:
1. Batt Insulation: ASTM C 991 Type 1; preformed formaldehyde-free glass fiber batt conforming to the following:
   a. Thermal Resistance: R of R-19 per 6 inches of depth.
   b. Batt Size: Equal to purlin/girt spacing by manufacturer's standard lengths.

c. Unfaced.

2. Roof Insulation: Formaldehyde-free fiberglass batt or fiberglass blanket complying with ASTM C 991 Type 1 and ASTM E 84 with a thermal resistance and thickness as follows:
   a. As indicated on the drawings.
   b. To meet R- value of R- 19 + R- 11 LS.
3. Wall Insulation: Formaldehyde-free fiberglass blanket or batt complying with ASTM C 991 Type 1, ASTM E 136 and ASTM E 84 with a thermal resistance and thickness as follows:
   a. As indicated on the drawings.
   b. To meet R- value of R- 13 + R- 6.5 ci.
4. Vapor Barrier Liner Fabric: Woven, reinforced, high-density polyethylene yarns coated on both sides with a continuous white or colored polyethylene coatings, as follows:
   a. Product complies with ASTM C 1136, Types I through Type VI.
   b. Perm rating: 0.02 for fabric and for seams in accordance with ASTM E 96.
   c. Flame/Smoke Properties:
      1) 25/50 in accordance with ASTM E 84.
      2) Self-extinguishes with field test using matches or butane lighter.
   d. Ultra violet radiation inhibitor to minimum UVMAX® rating of 8.
   e. Size and seaming: Manufactured in large custom pieces by extrusion welding from roll goods, and fabricated to substantially fit defined building area with minimum practicable job site sealing.
   f. Provide with factory triple, extrusion welded seams. Stapled seams or heat-melted seams are not acceptable due to degradation of fabric.
   g. Factory-folded to allow for rapid installation.
   h. Color:
      1) White.
5. Vapor Barrier Lap Sealant: Solvent-based, Polyethylene fabric adhesive.
6. Vapor Barrier Tape: Double-sided sealant tape 3/4 inch (19 mm) wide by 1/32 inch (.79 mm) thick.
7. Vapor Barrier Patch Tape: Single-sided, adhesive backed sealant tape 3 inches (76 mm) wide made from same material as liner fabric.
8. Thermal Breaks:
   a. 3/16 inch (4.7 mm) thick by 3 inch (76 mm) wide white, closed-cell polyethylene foam with pre-applied adhesive film and peel-off backing.
   b. Polystyrene snap-on thermal blocks.
9. Straps:
   a. 100 KSI minimum yield tempered, high-tensile-strength steel.
   b. Size:
      1) Not less than 0.020 inch (0.50 mm) thick by 1 inch (25 mm) by continuous length.
   c. Galvanized, primed, and painted to match specified finish color on the exposed side only.
   d. Color:
      1) Match Liner color.
10. Fasteners:
    a. For light gage steel: #12 by 3/4 (19 mm) inch plated Tek 2 type screws with sealing washer, painted to match specified color.
    b. For heavy gage steel: #12 by 1-1/2 inch (38 mm) plated Tek 4 type screws with sealing washer, painted to match specified color.
    c. For wood, concrete, other materials: As recommended by manufacturer.

11. Wall Insulation Hangers: Preformed rigid hangers, 32 inch (813 mm) long galvanized steel strips with barbed arrows every 8 inches (203 mm) along its length.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that building structure including all bracing and any concealed building systems are completed and approved prior to installing liner system and insulation in the structure.
B. Correct any unsatisfactory conditions before proceeding.
C. If conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 INSTALLATION - GENERAL

A. Install pre-engineered building insulation system in accordance with manufacturer's installation instructions and the approved shop drawings.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. Install in exterior spaces without gaps or voids. Do not compress insulation.
D. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
E. Fit insulation tight in spaces and tight to exterior side of the sealed liner fabric and around mechanical and electrical services within plane of insulation.

3.3 ROOF INSULATION INSTALLATION

A. Straps:
   1. Cut straps to length and install in the pattern and spacings indicated on shop drawings.
   2. Tension straps to required value.
B. Vapor Barrier Fabric:
   1. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
   2. Position pre-folded fabric on the strap platform along one eave purlin.
   3. Clamp the two bottom corners at the eave and also centered on the bay.
   4. Pull the other end of the pleat-folded fabric across the building width on the strap platform, pausing only at the ridge to fasten the straps and fabric in position where plane of roof changes and to release temporary fasteners on the opposite ridge purlins.
   5. Once positioned, install fasteners from the bottom side at each strap/purlins intersection.
   6. Trim edges and seal along the rafters.
   7. All seams must be completely sealed. Stapled seams are not acceptable.
C. Insulation:
   1. Unpack, and shake to a thickness exceeding the specified thickness.
   2. Ensure that cavities are filled completely with insulation.
   3. Place on the vapor barrier liner fabric without voids or gaps.
   4. Place top layer of insulation over and perpendicular to the purlins without voids or gaps, as roof sheathing is applied.
   5. Place thermal block on top of purlins or bottom of purlins for retrofit work, if no other thermal break exists.
   6. Place new insulation between purlins at the required thickness for the R-value specified.
D. Seal vapor barrier fabric to the wall fabric and elsewhere as required to provide a continuous vapor barrier.

3.4 WALL INSULATION INSTALLATION

A. Insulation:
   1. Install thermal break to exterior surface of girts as wall sheathing is applied.
   2. Install self-sticking foam thermal break to interior surface of girts prior to installation of insulation.
   3. Position and secure insulation hangers to girts on the inside face of the wall sheathing.
   4. Cut insulation to required lengths to fit vertically between girts.
   5. Fluff the insulation to the full-specified thickness.
   6. Neatly position in place and secure to hangers.
   7. Ensure that cavities are filled completely with insulation.

B. Vapor Barrier Fabric:
   1. Install vapor barrier fabric in large one-piece custom fabricated pieces to substantially fit defined building areas with minimum practicable job site sealing.
   2. Apply the vapor barrier fabric by clamping it in position over eave strap and installing fasteners through the eave strap into each roof strap, permanently clamping the wall fabric between them.
   3. Once in position, draw the vapor barrier fabric down over the column flanges to the base angle and install vertical straps along each column and 5 feet 0 inches on center, maximum, fastening to each girt to retain system permanently in place.
   4. All seams must be completely sealed. Stapled seams are not acceptable.

C. Seal wall fabric to the roof fabric, to the base angle and up the columns to provide a continuous vapor barrier.

3.5 CLEANING

A. Protect system products until completion of installation.
B. Repair or replace damaged products before completion of insulation system installation.

3.6 PROTECTION

A. Protect system products until completion of installation.
B. Repair or replace damaged products before completion of insulation system installation.

END OF SECTION

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Manufactured Products:
      a. Manufactured reglets and counter flashing.
   2. Formed Products:
      a. Formed roof drainage sheet metal fabrications.
      b. Formed low slope roof sheet metal fabrications.
      c. Formed steep slope roof sheet metal fabrications.
      d. Formed equipment support flashing.

B. Related Sections:
   1. Division 06 Section "Rough Carpentry" for wood nailers, curbs, and blocking.
   2. Division 07 Section "Thermoplastic Polyolefin (TPO) Roofing" for installing sheet metal flashing and trim integral with membrane roofing.

1.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain water tight.

B. Metal edging to be ES-1 certified.

C. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:
   1. Wind Zone 1: For velocity pressures of 10 to 20 lbf/sq. ft.: 40 lbf/sq. ft. perimeter uplift force, 60 lbf/sq. ft. corner uplift force, and 20 lbf/sq. ft. outward force.

D. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion joint locations, and keyed details. Distinguish between shop and field assembled work. Include the following:
   1. Identification of material, thickness, weight, and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
   3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
   4. Details of termination points and assemblies, including fixed points.
   5. Details of expansion joints and expansion joint covers, including showing direction of expansion and contraction.

6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counter flashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory applied color finishes involving color selection.

D. Qualification Data: For qualified fabricator.

E. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

F. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical roof eave, including built in gutter, gutter cover (fascia), fascia trim apron flashing, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Pre-installation Conference: Conduct conference at project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof mounted equipment.
2. Review methods and procedures related to sheet metal flashing and trim.
3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory applied finishes within specified warranty period.
1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
1. Basis of Design: Berridge Mfg. Co.
a. MCF: Berridge Metal Cap Flashing, Color: As selected by Architect to manufacturer's full range, or custom match to the existing.
2. Sheet Metal Roof Mfg.
3. MBCI metal roof and wall systems

B. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

C. Metallic Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot dip process and pre-painted by the coil coating process to comply with ASTM A 755/A 755M.
1. Zinc Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
2. Aluminum Zinc Alloy Coated Steel Sheet: ASTM A 792, Class AZ50 coating designation, Grade 40 structural quality.
3. Surface: Smooth and mill phosphatized for field painting and with manufacturer's standard clear acrylic coating on both sides.
4. Exposed Coil Coated Finish:
a. Two Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat and clear coats. Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
5. Concealed Finish: Pre-treat with manufacturer's standard white or light colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5mil.

2.2 UNDERLAYMENT MATERIALS

A. Self Adhering, High Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip resisting polyethylene film top surface laminated to layer of butyl or SBS modified asphalt adhesive, with release paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra. Basis of Design.
b. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
c. Henry Company; Blueskin PE200 HT.
d. Metal-Fab Manufacturing, LLC; MetShield.
e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

B. Slip Sheet: Building paper, 3 lb/100 sq. ft. minimum, rosin sized.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self tapping screws, self locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
   1. General: Blind fasteners or self drilling screws, gasketed, with hex washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory applied coating.
      b. Blind Fasteners: High strength aluminum or stainless steel rivets suitable for metal being fastened.
      c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
   2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
   3. Fasteners for Zinc Coated (Galvanized) Steel Sheet: Hot dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
   4. Fasteners for Zinc Sheet: Hot dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.

C. Solder:
   1. For Zinc Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
   2. For Zinc: ASTM B 32, 40 percent tin and 60 percent lead with low antimony, as recommended by manufacturer.

D. Sealant Tape: Pressure sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single component, solvent release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two part, noncorrosive, aluminum seam cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold applied asphalt emulsion complying with ASTM D 1187.

I. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
   1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
   2. Obtain field measurements for accurate fit before shop fabrication.
   3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

I. Do not use graphite pencils to mark metal surfaces.

2.5 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96 inch long sections. Furnish flat stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.

1. Gutter Style: SMACNA designation custom gutter cover shape refer to plans.
2. Expansion Joints: Built in.
3. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen. Wire ball downspout strainer Valley baffles.
   a. Galvanized Steel: Thickness to be as shown on Drawings, if no thickness is shown provide 0.040 inch thick.
4. Gutters covers: Fabricate from the following materials:
   a. Galvanized Steel: Thickness to be as shown on Drawings, if no thickness is shown provide 0.052 inch thick pre-finished.
   b. Aluminum-Zinc Alloy-Coated Steel: Thickness to be as shown on Drawings, if no thickness is shown provide 0.052 inch thick.

B. Downspouts: Fabricate round and rectangular downspouts complete with mitered elbows, refer to plans. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Fabricated Hanger Style: SMACNA figure designation. Custom refer to plans.
2. Manufactured Hanger Style: SMACNA figure designation. Custom refer to plans.
3. Hanger Style: Refer to plans.
4. Fabricate from the following materials: Thickness to be as shown on Drawings, if no thickness is shown provide:
   a. Galvanized Steel: 0.022 inch thick pre-finished.
   b. Zinc: 0.039 inch thick.
5. Provide 45 degree elbow with precast concrete splash block, where downspouts discharge. If not indicated on Drawings, approximate unit size 12” x 24” x 3”.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof-Edge Flashing Gravel Stop and Fascia Cap: Fabricate in minimum 96 inch long, but not exceeding 10 foot long, sections. Furnish with 6 inch wide, joint cover plates.
   1. Joint Style: Lap, 4 inches wide.
   2. Fabricate with scuppers spaced 10 feet apart, of dimensions required with 4 inch wide flanges and base extending 4 inches beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.
   3. Fabricate from Galvanized Steel: Thickness to be as shown on Drawings, if no thickness is shown provide 0.028 inch thick.

B. Copings: Fabricate in minimum 96 inch long, but not exceeding 10 foot long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld water tight.
   1. Coping Profile: SMACNA figure designation. Custom refer to plans.
   2. Joint Style: Butt, with 12 inch wide, concealed backup plate.
      Fabricate from Galvanized Steel: Thickness to be as shown on Drawings, if no thickness is shown provide 0.040 inch thick.

C. Roof and Roof to Wall Transition , Roof to Roof Edge Flashing (Gravel Stop) Transition, Roof to Roof Edge Flashing (Gravel Stop) and Fascia Cap Transition, Expansion Joint Cover: Fabricate from Galvanized Steel: 0.034 inch thick pre-finished.

D. Thickness of the following to be as shown on Drawings, if no thickness is shown provide:
   1. Base Flashing: Fabricate from Galvanized Steel: 0.028 inch thick.
   2. Counter flashing: Fabricate from Galvanized Steel: 0.022 inch thick pre-finished.
   3. Flashing Receivers: Fabricate from Galvanized Steel: 0.022 inch thick.
   4. Roof Penetration Flashing: Fabricate from Galvanized Steel: 0.028 inch thick.
   5. Roof-Drain Flashing: Fabricate from Zinc Tin Alloy Coated Stainless Steel: 0.015 inch thick.

2.7 STEEP SLOPE ROOF SHEET METAL FABRICATIONS

A. Apron, Step, Cricket, and Backer Flashing: Fabricate from Galvanized Steel: 0.022 inch thick pre-finished.

B. Thickness of the following to be as shown on Drawings, if no thickness is shown provide
   1. Valley Flashing: Fabricate from Galvanized Steel: 0.028 inch thick.
   2. Drip Edges: Fabricate from Galvanized Steel: 0.022 inch thick.
   3. Eave, Rake Ridge, and Hip Flashing: Fabricate from Galvanized Steel: 0.022 inch thick.
   4. Counter flashing: Fabricate from Galvanized Steel: 0.022 inch thick.
   5. Flashing Receivers: Fabricate from Galvanized Steel: 0.022 inch thick.
   6. Roof Penetration Flashing: Fabricate from Galvanized Steel: 0.028 inch thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from Galvanized Steel: Thickness to be as shown on Drawings, if no thickness is shown provide 0.028 inch thick.

B. Overhead Piping Safety Pans: Fabricate from Galvanized Steel: Thickness to be as shown on Drawings, if no thickness is shown provide 0.040 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.

2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of Installation means acceptance of existing substrate and conditions.

3.2 UNDERLAYMENT INSTALLATION

A. General: Install underlayment as indicated on Drawings.

B. Polyethylene Sheet: Install polyethylene sheet with adhesive for anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped and taped joints of not less than 2 inches.

C. Felt Underlayment: Install felt underlayment with adhesive for temporary anchorage to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

D. Self Adhering Sheet Underlayment: Install self adhering sheet underlayment, wrinkle free. Apply primer if required by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 16 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in water tight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently

watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws metal decking not less than recommended by fastener manufacturer to achieve maximum pull out resistance.

E. Seal joints as shown and as required for watertight construction.
   1. Where sealant filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant type joints at temperatures below 40 deg F.
   2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
   1. Do not solder metallic coated steel and aluminum sheet.
   2. Pre-tinning is not required for zinc tin alloy coated stainless steel and zinc tin alloy coated copper.
   3. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

G. Rivets: Rivet joints in uncoated aluminum and zinc where indicated and where necessary for strength.

3.4 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets, straps, and twisted straps spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.
   1. Fasten gutter spacers to front and back of gutter.
   2. Loosely lock straps to front gutter bead and anchor to roof deck.
   3. Anchor and loosely lock back edge of gutter to continuous eave or apron flashing.
   4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 16 inches apart.
   5. Anchor gutter with spikes and ferrules spaced not more than 16 inches apart.
   6. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion joint caps.
   7. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
   1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches O.C. in between.
   2. Provide elbows at base of downspout to direct water away from building.
   3. Connect downspouts to underground drainage system indicated.

D. Splash Pans: Install where downspouts discharge on low-slope EPDM roofs. Set in elastomeric sealant compatible with single ply roofing membrane.

E. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper gutter discharge.

F. Expansion Joint Covers: Install expansion joint covers at locations and of configuration indicated. Lap joints a minimum of 4 inches in direction of water flow.

3.5 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in SMACNA's "Architectural Sheet Metal Manual" and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3 inch centers.

C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 16 inch centers.

D. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.
   1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16 inch centers.
   2. Anchor interior leg of coping with screw fasteners and washers at 16 inch centers.

E. Pipe or Post Counter flashing: Install counter flashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.

F. Counter flashing: Coordinate installation of counter flashing with installation of base flashing. Insert counter flashing in reglets or receivers and fit tightly to base flashing. Extend counter flashing 4 inches over base flashing. Lap counter flashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of interlocking folded seam or blind rivets and sealant.

G. Roof Penetration Flashing: Coordinate installation of roof penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric [butyl] sealant and clamp flashing to pipes that penetrate roof.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Overhead Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.7 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturers written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures

END OF SECTION

SECTION 07 72 00 – ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Roof hatches.
   2. Roof curbs.
   3. Equipment supports.
   4. Preformed flashing sleeves.

B. Related Sections:
   1. Division 07 Section "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, coordinating penetrations and roof-mounted items, and special conditions. Distinguish between plant- and field-assembled work. Show the following:
   1. Size and location of roof accessories specified in this Section.
   2. Method of attaching roof accessories to roof or building structure.
   3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
   4. Required clearances.

C. Samples: For each exposed product and for each color and texture specified.

D. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

E. Warranty: Sample of special warranty.

1.5 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.6 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Finishes for Zinc-Coated (Galvanized) Steel Sheet, Aluminum-Zinc Alloy-Coated Steel Sheet, and Aluminum Sheet: ASTM B 209 (ASTM B 209M).
   1. Mill Finish: As manufactured.
   2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil (0.005 mm).
   3. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
      a. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
   4. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
   5. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation and mill phosphatized for field painting.

C. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, AZ50 (AZM150) coated.

D. Aluminum Sheet: ASTM B 209 (ASTM B 209M), manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
   1. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
   2. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

E. Aluminum Extrusions and Tubes: ASTM B 221 (ASTM B 221M), manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

F. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

G. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

H. Steel Tube: ASTM A 500, round tube.
I. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.
J. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.2 ROOF HATCH

A. Roof Hatches: Metal roof-hatch units with lids and insulated curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, integral metal cant or stepped integral metal cant raised the thickness of roof insulation, as required, and integrally formed deck-mounting flange at perimeter bottom.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Model #G3844 (size 2'-6"x3'-0") by Acudor Products Inc., Cedar Grove NJ (201/ 857-1800) or comparable product by one of the following:
      a. Type S-20 (size 2'-6" x 3'-0"), by Bilco Company, New Haven CT (203/ 934-6363).
      b. Model RB-1, as manufactured by Milcor, Lima OH (800/ 528-1411).
      c. Dur-Red Products.
      d. Hi Pro International, Inc.
      e. J. L. Industries, Inc.
      f. Nystrom.
      g. O'Keeffe's Inc.
      h. Pate Company (The).
      i. Western Canwell.
B. Type and Size, Finish: Roof Hatch shall be 14 gauge fiberglass insulated box type design; 22 gauge galvanized steel liner; hydraulic assist and self- latching outside turn handle; inside and outside padlock provisions; factory primed. Unpainted exterior. Interior to be field painted.
C. Loads: Minimum 40-lbf/sq. ft. (1.9-kPa) external live load and[20-lbf/sq. ft. (0.95-kPa) internal uplift load.
D. Hardware: Galvanized-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
   1. Provide two-point latch on lids larger than 84 inches (2130 mm).
E. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
   1. Height: 42 inches above finished roof deck.
   2. Posts and Rails: Galvanized steel pipe, 1-1/4 inches in diameter or galvanized steel tube, 1-5/8 inches in diameter.
   3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
   4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
   5. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
   6. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
   7. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
   8. Fabricate joints exposed to weather to be watertight.
   9. Fasteners: Manufacturer's standard, finished to match railing system.
   10. Finish: Manufacturer's standard.

a. Color: As selected by Architect from manufacturer's standard range.

F. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
2. Height: 42 inches (1060 mm) above finished roof deck.
3. Material: Steel tube or Aluminum.
4. Post: 1-5/8-inch- (41-mm-) diameter pipe.
5. Finish: Manufacturer's standard baked enamel.
a. Color: As selected by Architect from manufacturer's standard range.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polycarbonate Glazing: Thermoformable, monolithic polycarbonate sheets manufactured by extrusion process, burglar-resistance rated according to UL 972 with an average impact strength of 12 to 16 ft-lbf/in. (640 to 854 J/m) of width when tested according to ASTM D 256, Method A (Izod).

C. Cellulosic-Fiber Board Insulation: ASTM C 208, Type II, Grade 1, thickness as indicated.

D. Glass-Fiber Board Insulation: ASTM C 726, thickness as indicated.

E. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.

F. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

H. Underlayment:
1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

I. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

J. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

K. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

L. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

M. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 ROOF CURBS

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, integral metal cant as required, stepped integral metal cant raised the thickness of roof insulation as required, and integrally formed deck-mounting flange at perimeter bottom. Contractor shall provide and install roof curbs required by equipment manufacturer and roofing manufacturer such that neither manufacturer's warranty shall not be voided. Contractor shall coordinate selection of roof curb with both equipment and roofing manufacturers.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. AES Industries, Inc.
      b. Custom Solution Roof and Metal Products.
      c. Greenheck Fan Corporation.
      d. LM Curbs.
      e. Metallic Products Corp.
      f. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
      g. Roof Products, Inc.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Loads: As required by equipment manufacturer and as noted on Structural Documents.

D. Material: As designated by equipment and roofing manufacturers.
   1. Color or Finish: As selected by Architect from manufacturer's full range.

E. Construction:
   1. Insulation: Factory insulated with minimum 1-1/2-inch- (38-mm-) thick cellulosic or glass-fiber board insulation.
   2. Liner: Same material as curb, of manufacturer's standard thickness and finish.
   3. Factory-installed wood nailer at top of curb, continuous around curb perimeter.
   4. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
   5. Fabricate curbs to minimum height of 12 inches (300 mm) unless otherwise indicated or required by equipment or roofing manufacturer.
   6. Top Surface: Level around perimeter with roof slope accommodated by sloping the deck-mounting flange.
   7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
   8. Security Grille: Provide where indicated.

2.5 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, integral metal cant as required, stepped integral metal cant raised the thickness of roof insulation as required, and integrally formed deck-mounting flange at perimeter bottom. Contractor shall provide and install roof curbs required by equipment manufacturer and roofing manufacturer such that neither manufacturer's warranty shall not be voided. Contractor shall coordinate selection of roof curb with both equipment and roofing manufacturers.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. AES Industries, Inc.
   b. Custom Solution Roof and Metal Products.
   c. Greenheck Fan Corporation.
   d. LM Curbs.
   e. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
   f. Roof Products, Inc.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Loads: As required by equipment manufacturer and as noted on Structural Documents.

D. Material: As designated by equipment and roofing manufacturers.
1. Color or Finish: As selected by Architect from manufacturer's full range.

E. Construction:
1. Insulation: Factory insulated with minimum 1-1/2-inch- (38-mm-) thick cellulosic or glass-fiber board insulation.
2. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
3. Factory-installed continuous wood nailers 3-1/2 inches (90 mm) wide at tops of equipment supports.
4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
5. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
6. Fabricate equipment supports to minimum height of 12 inches (300 mm) unless otherwise indicated or required by equipment or roofing manufacturer.
7. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.
8. Security Grille: Provide where indicated.

2.6 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, minimum 12 inches (300 mm) high, with removable metal hood and slotted or perforated metal collar.
1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Custom Solution Roof and Metal Products.
   b. Thaler Metal USA Inc.
2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Diameter: As indicated.
4. Finish: Manufacturer's standard.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Custom Solution Roof and Metal Products.
   b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.

c. Thaler Metal USA Inc.
2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Height: 13 inches (330 mm), or as indicated.
4. Diameter: As indicated.
5. Finish: Manufacturer's standard.

2.7 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
C. Verify dimensions of roof openings for roof accessories.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.
1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Coat concealed side of stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
C. Roof Curb Installation: Install each roof curb so top surface is level.
D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.
E. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.
F. Seal joints with elastomeric or butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.
B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09 painting Sections.
C. Clean exposed surfaces according to manufacturer's written instructions.
D. Clean off excess sealants.
E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 92 00 - JOINT SEALANTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Section, apply to work specified in this section.

1.2 SECTION INCLUDES

A. Preparing sealant substrate surfaces.
B. Sealant and backing.

1.3 REFERENCES

A. ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open Cell Foam).
B. ASTM C790 - Use of Latex Sealing Compounds.
C. ASTM C834 - Latex Sealing Compounds.
D. FS TT-S-001657 - Sealing Compound, Single Component, Butyl Rubber Based, solvent Release Type.
E. FS TT-S-00227 - Sealing Compound: Elastomeric Type, Multi Component.
F. FS TT-S-001543 - Sealing Compound, Silicone Rubber Base.
G. SWI (Sealing and Waterproofers Institute) - Sealant and Caulking Guide Specification.

1.4 SUBMITTALS

A. Submit product data under provisions of Division 01 Section “Submittal Procedures”.
B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, color and availability.
C. Submit manufacturer's installation instructions under provisions of Division 01 Section “Submittal Procedures”.
D. Submit manufacturer's certificate under provisions of Division 01 Section “Quality Requirements” that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five (5) years documented experience.
B. Applicator: Company specializing in applying the work of this Section with minimum five (5) years documented experience.
C. Conform to Sealant and Water proofers Institute requirements for materials and installation.

1.6 FIELD SAMPLES

A. Provide samples under provisions of Division 01 Section “Submittal Procedures”.

B. Construct field sample panel, 2 feet long, illustrating sealant type, color, and tooled

surface.

C. Locate where directed.

D. Accepted sample may remain as part of the Work.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.8 SEQUENCING AND SCHEDULING

A. Coordinate work under provisions of Division 01 Section “Project Management and Coordination”.

B. Coordinate the work of this Section with all Sections referencing this Section.

1.9 WARRANTY

A. Provide five (5) year warranty under provisions of Division 01 Section “Warranties and Bonds”.

B. Warranty: Include coverage of installed sealants and accessories which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 SEALANTS

A. Acrylic Emulsion Latex: ASTM C834, single component; color as selected from manufacturer’s full range; equal to Sonolac as manufactured by Sonneborn Building Products.

B. Butyl Sealant: FS TT-S-001657, equal to Multipurpose sealant manufactured by Sonneborn Building Products.

C. Polysulphide Sealant: FS TT-S-00227, Type II non-sag, Class A; color as selected from manufacturer’s full range; equal to Sonolastic Two Part manufactured by Sonneborn Building Products.

D. Polysulphide Traffic Sealant: FS TT-S-00227 Type I self leveling, Class A; color as selected from manufacturer’s full range; equal to Sonolastic Paving Joint Sealant manufactured by Sonneborn Building Products.

E. Polyurethane Sealant: FS TT-S-00230, Type II non-sag, or I self leveling (as applicable), Class A; color as selected from manufacturer’s full range; manufactured by Sonneborn Building Products.

F. Silicone Sealant: FS TT-S-01543, Class A, medium modulus type; color as selected from manufacturer’s full range; equal to Silpruf manufactured by General Electric.

G. Sealant for stone/cast stone system: Latasil; manufactured by Laticrete; color as selected from manufacturer’s full range.

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
C. Joint Backing: ASTM D1565; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width; Sonnefoam Closed Cell Backer Rod manufactured by Sonneborn Building Products.
D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces or joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.
B. Beginning of installation means installer accepts existing surfaces.

3.2 PREPARATION

A. Clean and prime joints in accordance with manufacturer's instructions.
B. Remove loose materials and foreign matter which might impair adhesion of sealant.
C. Verify that joint backing and release tapes are compatible with sealant.
D. Perform preparation in accordance with ASTM C804 for solvent release or C790 for latex base sealants
E. Protect elements surrounding the work of this Section from damage or disfiguration.

3.3 INSTALLATION

		Type
A.	Install sealant in accordance with Manufacturer’s instructions.	Acrylic Emulsion Latex Sealant
B.	Measure joint dimensions and size materials to achieve required width/depth ratios.	Butyl Sealant
C.	Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.	Silicone Sealant or Polyurethane
D.	Install bond breaker where joint backing is not used.	Polysulphide Sealant
E.	Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.	Polysulphide Traffic Sealant
F.	Install sealant free of air pockets, foreign embedded matter, ridges, and sags.	Silicone Sealant or Polyurethane
G.	Tool joints concave.	

3.4 CLEANING AND REPAIRING

A. Clean work under provisions of Division 01 Section “Closeout Procedures”.
B. Clean adjacent soiled surfaces.
C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Division 01 Section “Closeout Procedures”.
B. Protect sealants until cured.

3.6 SCHEDULE

A. Location
1. Interior Door Frames and Trim.
2. Exterior Steel Door Frames and Thresholds.
3. Exterior Aluminum Entrance and Storefront Framing and Alum. Window Frames.
4. Expansion and Control Joints in Masonry and Concrete.
5. Expansion and Control Joints in Concrete Paving, Ramps, Walks and Curbs.
6. Miscellaneous Metal Flashings, Louvers and Metal Joints.

END OF SECTION

SECTION 08 11 13 – HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Standard hollow metal doors and frames.
B. Related Sections:
   1. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
   2. Division 09 Sections “Painting" for field painting hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.
B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

A. Per Division 01 section “Submittal Procedures”.
B. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire resistance rating, and finishes.
C. Shop Drawings: Include the following:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.
D. Samples for Verification:
   1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
   2. For the following items, prepared on Samples about 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
      a. Doors: Show vertical edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
      b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow metal panels and glazing if applicable.
E. Other Action Submittals:
   1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
F. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
B. Fire Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire protection ratings indicated, based on testing at positive pressure according to UL 10C.
C. Fire Rated, Borrowed Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.
D. Smoke Control Door Assemblies: Comply with NFPA 105 or UL 1784.
E. Pre installation Conference: Conduct conference at Project site. Per Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
   1. Provide additional protection to prevent damage to finish of factory finished units.
B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4 inch high wood blocking. Do not store in a manner that traps excess humidity.
   1. Provide minimum ¼ inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Ceco Door Products; an Assa Abloy Group company.
   2. Steelcraft; an Ingersoll Rand company.
   3. Curries Company; an Assa Abloy Group company.
   4. Republic Builders Products.

2.2 MATERIALS

A. Cold Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
B. Hot Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
C. Metallic Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 (ZF120) metallic coating.
D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
    1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot dip galvanized according to ASTM A 153/A 153M, Class B.
E. Inserts, Bolts, and Fasteners: Hot dip galvanized according to ASTM A 153/A 153M.
F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
G. Mineral Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6 to 12 lb/cu. ft. density; with maximum flame spread and smoke development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
H. Glazing: Comply with requirements in Division 08 Section "Glazing."

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
    1. Design: Flush panel.
    2. Core Construction: Manufacturer's standard kraft paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral board, or vertical steel stiffener core.
        a. Fire Door Core: As required to provide fire protection ratings indicated.
        b. Thermal Rated (Insulated) Doors: All exterior doors and where indicated, provide doors fabricated with thermal resistance value (R value) equal to or better than Ceco Imperial Series when tested according to ASTM C 1363.
            1) Locations: Exterior doors.
    3. Vertical Edges for Single Acting Doors: Beveled edge.
        a. Beveled Edge: 1/8 inch in 2 inches.
    4. Vertical Edges for Double Acting Doors: Round vertical edges with 2-1/8 inch radius.
    5. Top and Bottom Edges: Closed with flush or inverted 0.042 inch thick, end closures or channels of same material as face sheets.
    6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
B. Exterior Doors: Face sheets fabricated from metallic coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
    1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).
C. Interior Doors: Face sheets fabricated from cold rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
    1. Level 2 and Physical Performance Level B (Heavy Duty), Model 1 (Full Flush).
D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold or hot rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
B. Exterior Frames: Fabricated from metallic coated steel sheet.
   1. Fabricate frames as full profile welded unless otherwise indicated.
   2. Frames for Level 2 Steel Doors: 0.053 inch thick steel sheet.
   3. Frames for Level 3 Steel Doors: 0.053 inch thick steel sheet.
C. Interior Frames: Fabricated from cold-rolled steel sheet.
   1. Fabricate frames as full profile welded unless otherwise indicated.
   2. Frames for Level 2 Steel Doors: 0.053 inch thick steel sheet.
   3. Frames for Level 3 Steel Doors: 0.053 inch thick steel sheet.
   4. Frames for Wood Doors: 0.053 inch thick steel sheet.
   5. Frames for Borrowed Lights: Same as adjacent door frame.
D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.6 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
B. Ceiling Struts: Minimum ¼ inch thick by 1inch wide steel.
C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.7 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.
C. Hollow Metal Doors:
   1. Exterior Doors: Provide weep hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
   2. Glazed Lites: Factory cut openings in doors.
   3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat or oval head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
    a. Formed from same material as frames, not less than 0.042 inch thick, and as follows:
        1) Monolithic Concrete Slabs: Clip type anchors, with two holes to receive fasteners.
        2) Separate Topping Concrete Slabs: Adjustable type anchors with extension clips, allowing not less than 2 inch height adjustment. Terminate bottom of frames at finish floor surface.
6. Jamb Anchors: Provide number and spacing of anchors as follows:
    a. Metal Building System Wall Type: Manufacturer's standard units, galvanized according to ASTM A 123/A 123M.
    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
        6) Stud Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
7. Door Silencers: Except on weather stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
    a. Single Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non templated, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.

2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.8 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pre-treating.
   1. Shop Primer: Manufacturer's standard, fast curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine roughing in for embedded and built in anchors to verify actual locations before frame installation.
C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness per ANSI/NAAMM-HMMA 861.
C. Drill and tap doors and frames to receive non-templated, mortised, and surface mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
B. Do not bend frames during installation of frame, studs, gypsum board, etc. Any frames damaged in installation shall be replaced.
C. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
   1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. At fire protection rated openings, install frames according to NFPA 80.

b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that are filled with grout containing anti freezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post installed expansion anchors.
   a. Floor anchors may be set with powder actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.
3. Metal Stud Partitions: Solidly pack mineral fiber insulation behind frames.
4. In Place Gypsum Board Partitions: Secure frames in place with post installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

D. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non Fire Rated Standard Steel Doors:
   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
   d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
2. Fire Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke Control Doors: Install doors according to NFPA 105.

E. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat or oval head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Metallic Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

3.5 PROTECTION

A. **DO NOT install temporary locks such as padlocks or hardware that puncture doors and frames. This requirement is especially important on all fire rated doors and frames.**

1. Submit data on Temporary Locks that do not puncture the doors or frames. Only approved Temporary Locks can be used to secure doors during construction.
    a. Acceptable Manufacturers include but are not limited to :
        1) Modern Manufacturing Company
            a) Model: UI-2 Universal In- swing or Out- swing Lock.

END OF SECTION

SECTION 08 36 13 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes electrically operated sectional doors.
B. Related Sections:
   1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.
B. Delegated Design: Design sectional doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
C. Structural Performance: Exterior sectional doors shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
   1. Wind Loads: As indicated on Drawings.
   2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components. Deflection of door in horizontal position (open) shall not exceed 1/120 of the door width.
D. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283 or DASMA 105.
   1. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h).
E. Operation Cycles: Provide sectional door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.4 SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory. Include the following:
   1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
   2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
D. Delegated-Design Submittal: For sectional doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Detail fabrication and assembly of seismic restraints.
   2. Summary of forces and loads on walls and jambs.
E. Qualification Data: For qualified Installer.
F. Maintenance Data: For sectional doors to include in maintenance manuals.
G. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
B. Source Limitations: Obtain sectional doors from single source from single manufacturer.
   1. Obtain operators and controls from sectional door manufacturer.
C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
D. Standard for Sectional Doors: Fabricate sectional doors to comply with DASMA 102 unless otherwise indicated.
E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Faulty operation of hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
      d. Delamination of exterior or interior facing materials.
   2. Manufacturer’s limited door and operators System warranty for 10 year against delamination of polyurethane foam from steel face and all other components for 3 years or 20,000 cycles, whichever comes first.
B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DOOR ASSEMBLY

A. Steel Sectional Door: Sectional door formed with hinged sections.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide **Insulated Steel Sectional Overhead Doors: 592 Series Thermacore Insulated Steel Doors by Overhead Door Corporation.**

2. Other Manufacturers are to be approved during bidding.
    a. Per Division 01 Section Substitution Procedures.
    b. Provide all required information for evaluation that the substitution matches existing sectional doors.

B. Operation Cycles: Not less than 10,000.

C. Door Assembly:
1. Metal/foam/metal sandwich panel construction, with PVC thermal break and weather-tight ship-lap design meeting joints.

D. Thermal Values:
1. R-Value: 17.5
2. U- Value: 0.057

E. Steel Sections:
1. Section Thickness: 2 inches (51 mm).
2. Exterior-Face, Steel Sheet Thickness: .015 inch (.38 mm) nominal coated thickness, hot-dipped galvanized.
    a. Surface: Manufacturer's standard, ribbed.
3. Insulation: Board.
4. Interior Facing Material: Zinc-coated (galvanized) steel sheet of manufacturer's recommended thickness to meet performance requirements nominal coated thickness.
5. Interior Facing Material: Hardboard panel.

F. Track Configuration: Low clearance.

G. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
1. Size: 3- inch.

H. Weatherseals: Fitted to bottom and top and around entire perimeter of door.

I. Windows:
1. Equally spaced in width, and matching the existing height or as shown on drawings**.**
2. Square corners.
3. As shown on drawings.
4. Installed with insulated glazing of the following type: Manufacturer's standard.

J. Roller-Tire Material: Manufacturer's standard.

K. Locking Devices: Equip door with: Locking Device Assembly: Single-jamb side.

L. Counterbalance Type: Torsion spring.

M. Electric Door Operator:
1. Basis-of-Design Product: Subject to compliance with requirements, provide **Commercial Sectional Door Operator: Model RSX Commercial Door Operator by Overhead Door Corporation.**
2. Usage Classification: Standard duty, up to 60 cycles per hour.
3. Operator Type: Side mounted.
4. Motor Exposure: Interior, clean, and dry.
5. Emergency Manual Operation: Match Existing.
6. Entrapment Protection:
    a. Control system shall have provisions to connect monitored entrapment protection devices such as monitored electric sensing edge, or monitored photo-eye and to provide constant contact close control operation in lieu of such devices.
7. Remote-Control Station: Interior.

N. Door Finish:
1. Baked-Enamel or Powder-Coated Finish: Match existing, Color and gloss as selected by Architect from manufacturer's full range.
2. Finish of Interior Facing Material: Match finish of existing.

2.2 STEEL DOOR SECTIONS

A. Exterior Section Faces and Frames: Fabricate from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated zinc coating and thickness.
   1. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.

B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch- (1.63-mm-) nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch- (1.63-mm-) thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches (1219 mm) apart.

C. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place. Ensure that reinforcement does not obstruct vision lites.

D. Provide reinforcement for hardware attachment.

E. Board Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polystyrene or polyurethane board insulation, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84; or with glass-fiber-board insulation. Secure insulation to exterior face sheet. Enclose insulation completely within steel sections that incorporate the following interior facing material, with no exposed insulation:
   1. Interior Facing Material: Manufacturer's standard prefinished hardboard panel, 1/8 inch (3 mm) thick and complying with ANSI A135.5.

F. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.3 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances shown on Drawings, and complying with ASTM A 653/A 653M for minimum G60 (Z180) zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device. Slope tracks at proper angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.

B. Track Reinforcement and Supports: Galvanized-steel track reinforcement and support members, complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.
   1. Track Assembly:
      a. Track orientation and type as shown on drawings.
      b. Reinforcing angles attached to track and attached to wall as needed.

C. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

D. Windows: Manufacturer's standard window units of type and size indicated and in arrangement shown. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.

2.4 HARDWARE

A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch- (2.01-mm-) nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges where required, for doors over 16 feet (4.88 m) wide unless otherwise recommended by door manufacturer.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- (76-mm-) diameter roller tires for 3-inch- (76-mm-) wide track and 2-inch- (51-mm-) diameter roller tires for 2-inch- (51-mm-) wide track.

2.5 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.

2.6 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Cables: Galvanized-steel lifting cables with cable safety factor of at least **7** to 1.

C. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

D. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

E. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

2.7 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.

1. Jackshaft, Side Mounted: Jackshaft operator mounted on the inside front wall on right or left side of door and connected to torsion shaft with an adjustable coupling or drive chain.

D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.

1. Electrical Characteristics:
   a. Phase: Single phase.
   b. Volts: 115 V.
   c. Hertz: 60.
2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
   a. Match Existing.

5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
6. Use adjustable motor-mounting bases for belt-driven operators.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.
   1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
      a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensor device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.
   2. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
      a. Self-Monitoring Type: Four-wire configured device designed to interface with door-operator control circuit to detect damage to or disconnection of sensor edge.

G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."
   1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
B. Examine locations of electrical connections.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
B. Tracks:
   1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches (610 mm) apart.
   2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.
   3. Repair galvanized coating on tracks according to ASTM A 780.
C. Accessibility: Install sectional doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
B. Lubricate bearings and sliding parts as recommended by manufacturer.
C. Adjust doors and seals to provide weathertight fit around entire perimeter.
D. Align and adjust motors, pulleys, belts, sprockets, chains, and controls according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION

SECTION 08 51 13 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes:
   1. Fixed aluminum-framed windows for exterior locations.

1.3 DEFINITIONS

A. Performance class designations according to AAMA/WDMA 101/I.S.2/NAFS:
   1. AW: Architectural.
   2. HC: Heavy Commercial.
   3. C: Commercial.
   4. LC: Light Commercial.

B. Performance grade number according to AAMA/WDMA 101/I.S.2/NAFS:
   1. Design pressure number in pounds force per square foot (pascals) used to determine the structural test pressure and water test pressure.

C. Structural Test Pressure: For uniform load structural test, is equivalent to 150 percent of the design pressure.

D. Minimum Test Size: Smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

1.4 REFERENCES

A. ASTM B221 – Aluminum Alloy Extruded Bar, Rod, Wire, Shape, and Tube.
B. ASTM E283 - Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors.
C. ASTM A 240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
D. ASTM A 653 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
E. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
F. ASTM B 221 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
G. ASTM B 580 - Standard Specification for Anodic Oxide Coatings on Aluminum.
H. ASTM B 680 - Standard Test Method for Seal Quality of Anodic Coatings on Aluminum by Acid Dissolution.
I. ASTM C 1048 - Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.
J. ASTM C 1172 - Standard Specification for Laminated Architectural Flat Glass.
K. ASTM E 774 - Standard Specification for Sealed Insulating Glass Units.
L. Aluminum Association AA DAF-45 - Designation System for Aluminum Finishes.
M. FS TT-P-641 - Primer Coating; Zinc Dust Zinc Oxide (For Galvanized Surfaces).
N. FS TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.
   1. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, installation details, and the following:
   1. Mullion details, including reinforcement and stiffeners.
   2. Joinery details.
   3. Expansion provisions.
   4. Flashing and drainage details.
   5. Weather-stripping details.
   6. Thermal-break details.
   7. Glazing details.
   8. For installed products indicated to comply with design loads, include structural analysis data prepared by or under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum windows and used to determine the following:
      a. Structural test pressures and design pressures from wind loads indicated.
      b. Deflection limitations of glass framing systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.
   1. Include similar Samples of hardware and accessories involving color selection.

D. Samples for Verification: For aluminum windows and components required, prepared on Samples of size indicated below.
   1. Main Framing Member: 12-inch- (300-mm-) long, full-size sections of extrusions with factory-applied color finish.
   2. Window Corner Fabrication: 12-by-12-inch- (300-by-300-mm-) long, full-size window corner including full-size sections of extrusions with factory-applied color finish, weather stripping, and glazing.
   3. Hardware: Full-size units with factory-applied finishes.
   4. Weather Stripping: 12-inch- (300-mm-) long sections.

E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

F. Qualification Data: For Installer and manufacturer.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for each type, class, grade, and size of aluminum window. Test results based on use of downsized test units will not be accepted.

H. Maintenance Data: For operable window sash, operating hardware, weather stripping, and finishes to include in maintenance manuals.

I. Warranty: Special warranty specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

B. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.

C. Source Limitations:
   1. Obtain aluminum windows through one source from a single manufacturer.

D. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements." Do not modify size and dimensional requirements.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Fenestration Standard: Comply with AAMA/WDMA 101/I.S.2/NAFS, "North American Fenestration Standard Voluntary Performance Specification for Windows, Skylights and Glass Doors," for definitions and minimum standards of performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.
1. Provide AAMA-certified aluminum windows with an attached label.

F. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.
1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
c. Faulty operation of movable sash and hardware.
d. Deterioration of metals, other materials, and metal finishes beyond normal weathering.
e. Failure of insulating glass.
2. Warranty Period:
a. Window: Three years from date of Substantial Completion.
b. Glazing: 10 years from date of Substantial Completion.
c. Metal Finish: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIXED WINDOW MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Kawneer: Series Trifab VG 451 (Not Hurricane or Blast Rated) Window** or a comparable product by one of the following:
1. EFCO Corporation.
2. Kawneer; an Alcoa Company.
3. Manko Window Systems. Inc.
4. Oldcastle Building Envelope company.
5. Peerless Products Inc.
6. United States Aluminum.

2.2 FIXED WINDOW MATERIALS

A. Extruded Aluminum: ASTM B221; 6063 T5 alloy, temper.
B. Touch Up Primer for Galvanized Surfaces: FS TT-P-641 or TT-P-645.
C. Fasteners: ASTM A 164 Aluminum, stainless or galvanized steel.

2.3 FIXED WINDOW COMPONENTS

A. Frames: 2 x 4- inch profile, thermal break flush glazing system.
B. Mullion: 2 x 4-1/2 inch profile of thermal break extruded aluminum.
C. Sills: Extruded aluminum; sloped for positive wash; slope depth for under sash leg to 1/2 inch beyond wall face; one piece full width of opening; jamb angles to terminate sill length.

2.4 WINDOW MATERIALS

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength, not less than 16,000-psi (110-MPa) minimum yield strength, and not less than 0.070-inch thickness at any location for the main frame and sash members.
B. Thermal Barrier:
   1. Thermal Barrier: The thermal barrier shall be with a nominal 1/4" (6.35 mm) separation consisting of a two-part, chemically curing high density polyurethane which is mechanically and adhesively bonded to the aluminum.
C. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.
   1. Reinforcement: Where fasteners screw anchor into aluminum less than 0.125 inch (3.2 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
D. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
E. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
F. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action and for complete concealment when aluminum window is closed.
   1. Weather-Stripping Material: Elastomeric cellular preformed gaskets complying with ASTM C 509.
   2. Weather-Stripping Material: Dense elastomeric gaskets complying with ASTM C 864.
   3. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/WDMA 101/I.S.2/NAFS.
G. Sliding-Type Weather Stripping: Provide woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701/702.
   1. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material. Comply with AAMA 701/702.
H. Replaceable Weather Seals: Comply with AAMA 701/702.
I. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

2.5 WINDOW - GENERAL

A. AAMA/WDMA Performance Requirements: Provide aluminum windows of performance indicated that comply with AAMA/WDMA 101/I.S.2/NAFS.
   1. Performance Class and Grade: HC70.
   2. Performance Class and Grade: AW70.
   3. Performance Class: HC or AW.

B. Thermal Transmittance: Provide aluminum windows with a whole-window, U-factor maximum indicated at 15-mph (24-km/h) exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.
   1. U-Factor not more than .51 BTU/hr/sf/°F.

C. Thermal Barrier Tests: Testing shall be in general accordance with AAMA 505 Dry Shrinkage and Composite Thermal Cycling test procedure, AAMA TIR-A8, Structural Performance of Composite Thermal Barrier systems.

D. Sound Transmission Class (STC): Sound: testing per ASTM 1801 with 1" (25,4 mm) insulating glass made with (1/4” annealed exterior with 1/2” air space, 1/4” annealed interior): minimum (34 STC) and (29 OITC).

E. Air Infiltration: The test specimen shall be tested in accordance with ASTM E 283 at a minimum window size of 66" x 120" (1676 x 3048 mm). The air infiltration rate shall not exceed 0.30 cfm/ft at a static air pressure differential of 6.24 psf (300 Pa).

F. Water Resistance: The test specimen shall be tested in accordance with ASTM E 547 and ASTM E 331 at a minimum window size of 66" x 120" (1676 x 3048 mm). There shall be no leakage as defined in the test method at a static air pressure differential of 10 psf (479 Pa).

G. Forced-Entry Resistance: Comply with Performance Grade 10 requirements when tested according to ASTM F 588.

H. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/WDMA 101/I.S.2/NAFS.

I. Operating Force and Auxiliary (Durability) Tests: Comply with AAMA/WDMA 101/I.S.2/NAFS for operating window types indicated.

2.6 WINDOW FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

C. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

F. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- (1.6-mm-) thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

G. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 08 Section "Glazing" and with AAMA/WDMA 101/I.S.2/NAFS.

H. Glazing Stops: Provide snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.7 GLAZING

A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Finish colors are as shown on Drawings and below:
   1. Clear Anodic Finish: AAMA 611, AA-M10C22A44, Class I, 0.7 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate, and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight window installation.
   1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
   2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
   3. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning installation indicates acceptance of conditions.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. Ensure openings to receive windows are plumb, level, square, accurately aligned, correctly located, and in tolerance.

3.3 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.
B. Install in accordance with manufacturer's instructions.
C. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

D. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.
E. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
F. Anchor windows securely in place to supports. Use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction.
G. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
H. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Architect.
I. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.
B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
    1. Structural-Sealant Compatibility and Adhesion: Structural sealant shall be tested according to recommendations in ASTM C 1401.
        a. Destructive Test Method A, "Hand Pull Tab (Destructive)," in ASTM C 1401, Appendix X2, shall be used.
            1) A minimum of two areas on each building face shall be tested.
            2) Repair installation areas damaged by testing.
    2. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. (0.03 L/s per sq. m), of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).
    3. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum uniform and cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft. (200 Pa), and shall not evidence water penetration.
    4. Water Spray Test: On each building, Before installation of interior finishes has begun, a minimum area of 75 feet (23 m) by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
F. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.
B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

3.6 CLEANING

A. Comply with manufacturer's written recommendations for final cleaning and maintenance.
B. Remove nonpermanent labels, and clean surfaces.
C. Remove protective material from factory finished aluminum surfaces.
D. Clean aluminum surfaces immediately after installation in accordance with manufacturer's instructions.
E. Remove excess joint sealant in accordance with sealant manufacturer's instructions.
F. Do not use harsh cleaning materials or methods that would damage glazing or finish.

3.7 PROTECTION

A. Protect installed products until completion of project.
B. Protect window surfaces from contact with contaminating substances resulting from construction operations.
    1. Monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.
C. Touch-up, repair or replace damaged products.

END OF SECTION

SECTION 08 70 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Mechanical door hardware for the following:
      a. Swinging doors.
   2. Cylinders for door hardware specified in other Sections.
   3. Electrified door hardware.

B. Related Requirements:
   1. Division 08 Section "Hollow Metal Doors and Frames".
   2. Division 08 Section "Flush Wood Doors" for provided as part of labeled fire-rated assemblies.
   3. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, cylinders.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner's security consultant.

B. Keying Conference: Conduct conference at Project site.
   1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner's security consultant.
   2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
      a. Flow of traffic and degree of security required.
      b. Preliminary key system schematic diagram.
      c. Requirements for key control system.
      d. Requirements for access control.
      e. Address for delivery of keys.

1.4 SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For electrified door hardware.
   1. Include diagrams for power, signal, and control wiring.
   2. Include details of interface of electrified door hardware and building safety and security systems.

C. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
   1. Tag Samples with full product description to coordinate Samples with door hardware schedule.

D. Samples for Initial Selection: For each type of exposed finish.
E. Samples for Verification: For each type of exposed product, in each finish specified.
   1. Sample Size: Full-size units or minimum 2-by-4-inch (51-by-102-mm) Samples for sheet and 4-inch (102-mm) long Samples for other products.
   2. Tag Samples with full product description to coordinate Samples with door hardware schedule.
F. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
   2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
   3. Content: Include the following information:
      a. Identification number, location, hand, fire rating, size, and material of each door and frame.
      b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
      c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
      d. Description of electrified door hardware sequences of operation and interfaces with other building control systems.
      e. Fastenings and other installation information.
      f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
      g. Mounting locations for door hardware.
      h. List of related door devices specified in other Sections for each door and frame.
G. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.
H. Qualification Data: For Installer and Architectural Hardware Consultant.
I. Product Certificates: For each type of electrified door hardware.
   1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
J. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
K. Maintenance Data: For each type of door hardware to include in maintenance manuals.
L. Schedules: Final door hardware and keying schedule.
M. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
N. Warranty: Special warranty specified in this Section.
O. Quantities shall be determined by the bidder.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and whom employee an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
   1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
   1. For door hardware, an Architectural Hardware Consultant (AHC).
   2. The AHC shall be made available for consultations.

C. Source Limitations: Obtain each type of door hardware from a single manufacturer.

D. Use a qualified installer experienced in the preparation and installation of finish hardware.

E. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

F. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
   1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.

G. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

H. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
   2. Comply with the following maximum opening-force requirements:
      a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
   3. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Provide a secure, dry and clean room with adequate shelving to keep hardware off the floor.

D. If, after coordination with Owner, the Owner is to install the permanent cores. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.7 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
B. Keying is to be coordinated with the Owner.

1.8 WARRANTY

A. Provide a minimum 1 year factory warranty for all hardware products.
B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
    1. Failures include, but are not limited to, the following:
        a. Structural failures including excessive deflection, cracking, or breakage.
        b. Faulty operation of doors and door hardware.
        c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
    2. Warranty Period: From date of Substantial Completion, unless otherwise indicated.
        a. Provide a minimum 1 year factory warranty for all hardware products.
        b. Any factory warranty longer than 1 year shall apply to hardware on this project.

1.9 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
B. Maintenance Service: Beginning at Substantial Completion, provide twelve months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 HARDWARE

A. Provide items as listed in Schedule in this Section, complete to function as intended.
B. Substitutions: Request for substitutions of items of hardware shall be made to the Architect no later than ten days prior to bid opening. Approval of substitutions will only be in writing or by addendum. Request for substitutions shall be accompanied by samples and or detailed information as to the manufacturer of the product.
C. Items specified "NO SUBSTITUTIONS" shall be provided exactly as listed in this Specification.

2.2 MANUFACTURERS SCHEDULED:

CR	-	CORBIN RUSWIN	**NO SUBSTITUTION**
BE	-	BEST	**NO SUBSTITUTION**
IVE	-	IVES	
GLY	-	GLYNN- JOHNSON	
LCN	-	LCN DOOR CLOSERS	

MAR - MARKAR
P - PBB HINGE COMPANY
PE - PEMKO MANUFACTURING
R - ROCKWOOD MANUFACTURING
V - VON DUPRIN, INC. **NO SUBSTITUTION**
ZER - ZERO INTERNATIONAL

2.3 PERFORMANCE REQUIREMENTS

A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested in accordance with UL 1784 and installed in compliance with NFPA 105.
   1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
D. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the USDOJ's "2010 ADA Standards for Accessible Design" ICC A117.1.
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
   2. Comply with the following maximum opening-force requirements:
      a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
      b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
      c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
   3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
   4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
   5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.4 HINGES

A. All exterior doors are to have Continuous Hinges.
B. The number of door hinges per door leaf is to be as scheduled OR per manufacturer’s recommendations whichever is more stringent.
C. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bommer Industries, Inc.
      b. Hager Companies.
      c. IVES Hardware; an Allegion company.

d. McKinney Products Company; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY.
e. PBB, Inc.

2.5 CONTINUOUS HINGES

A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Bommer Industries, Inc.
      b. Hager Companies.
      c. IVES Hardware; an Allegion company.
      d. McKinney Products Company; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY.
      e. PBB, Inc.
      f. Pemko Manufacturing Company Inc.; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY.
      g. Zero International; Allegion plc.

2.6 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.
B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
   1. Cylindrical Locks: Minimum 3/4-inch (19-mm) latchbolt throw.
   2. Deadbolts: Minimum 1-inch (25-mm) bolt throw.
C. Lock Backset: 2-3/4 inches (70 mm) unless otherwise indicated.
   1. Coordinate with doors.
   2. 2-3/4 inches (70 mm), unless otherwise indicated.
D. Lock Trim:
   1. Description: As indicated on Hardware Schedule.
   2. Levers: Manufacturer’s standard.
   3. Escutcheons (Roses): Manufacturer’s standard.
   4. Dummy Trim: Match lever lock trim and escutcheons.
E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
F. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Corbin Ruswin

2.7 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. IVES Hardware; an Allegion company.
      b. Rockwood; an ASSA ABLOY Group company.
      c. Trimco.

2.8 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

A. Automatic and Self-Latching Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. IVES Hardware; an Allegion company.
      b. Rockwood; an ASSA ABLOY Group company.
      c. Trimco.

2.9 DUST PROOF STRIKE

A. BHMA A156.16
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. IVES Hardware; an Allegion company.
      b. Rockwood; an ASSA ABLOY Group company.
      c. Trimco.

2.10 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Von Duprin; an Allegion company. **NO SUBSTITUTION**

2.11 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Best. **NO SUBSTITUTION**
B. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.12 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.

1. Master Key System: Change keys and a master key operate cylinders.
   a. Provide three cylinder change keys and five master keys.
2. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
   a. Provide three cylinder change keys and five each of master and grand master keys.
3. Keyed Alike: Key all cylinders to same change key.

B. Keys:
1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
   a. Notation: "DO NOT DUPLICATE."
2. Quantity: In addition to one extra key blank for each lock, provide the following:
   a. Each Cylinder: Two per Cylinder.
   b. Cylinder Change Keys: Three.
   c. Master Keys: Five.
   d. Grand Master Keys: Five.

2.13 KEY CONTROL SYSTEM

A. Key Control Cabinet: BHMA A156.28; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, two sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Key Boxes and Cabinets.
   b. HPC, a Hudson Lock Company.
   c. Interlogix; Carrier Global Corporation.
   d. Lund Equipment Co., Inc.
   e. MMF Industries.
   f. TelKee; Oasis International.
2. Wall-Mounted Cabinet: Grade 1 cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

2.14 ACCESSORIES FOR PAIRS OF DOORS

A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.
B. Astragals: BHMA A156.22.

2.15 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, with **NO SUBSTITUTION**:
   a. LCN Closers; an Allegion company.
   b. Norton Door Controls; an ASSA ABLOY Group company. 7500 Series

2.16 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. IVES Hardware; an Allegion company.
b. Rockwood; an ASSA ABLOY Group company.
c. Trimco.

2.17 ELECTROMAGNETIC STOPS AND HOLDERS

A. Electromagnetic Door Holders: BHMA A156.15, Grade 1; wall-mounted electromagnetic single unit with strike plate attached to swinging door; coordinated with fire detectors and interface with fire-alarm system for labeled fire-rated door assemblies.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following, with **NO SUBSTITUTION**:
a. LCN Closers; an Allegion company.

2.18 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Glynn-Johnson; an Allegion company.
b. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
c. Rockwood; an ASSA ABLOY Group company.

2.19 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hager Companies.
b. National Guard Products, Inc.
c. Pemko Manufacturing Company Inc.; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY.
d. Zero International; Allegion plc.

B. Maximum Air Leakage: When tested in accordance with ASTM E283 with tested pressure differential of 0.3-inch wg (75 Pa), as follows:
1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
2. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.
3. Gasketing on Double Doors: 0.50 cfm per ft. (0.000774 cu. m/s per m) of door opening.

2.20 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Hager Companies.

b. National Guard Products, Inc.
c. Pemko Manufacturing Company Inc.; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY.
d. Zero International; Allegion plc.

2.21 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.
   1. Manufacturer's identification is permitted on rim of lock cylinders only.
B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
   1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
   2. Fire-Rated Applications:
      a. Wood or Machine Screws: For the following:
         1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
         2) Strike plates to frames.
         3) Closers to doors and frames.
      b. Steel Through Bolts: For the following unless door blocking is provided:
         1) Surface hinges to doors.
         2) Closers to doors and frames.
         3) Surface-mounted exit devices.
   3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
   4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.22 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames in accordance with ANSI/SDI A250.6.
B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).
E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Replace construction cores with permanent cores as directed by Owner.
   2. Furnish permanent cores to Owner for installation.
F. Key Control System:
   1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
   2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.

3. Key Control System Software: Set up multiple-index system based on final keying schedule.

G. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
   1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

H. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

I. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

J. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
   1. Do not notch perimeter gasketing to install other surface-applied hardware.

K. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

L. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

3.7 DOOR HARDWARE SCHEDULE

HARDWARE SETS:

HW Set # 1
For use on Door #(s):
103
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRANCE/OFFICE	CL3151 NZD LC	626	C-R
1	EA	FSIC CORE	VERIFY AND MATCH EXISTING KEY SYSTEM	626	BE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HW Set # 2
For use on Door #(s):
112
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	CL3157 NZD LC	626	C-R
1	EA	FSIC CORE	VERIFY AND MATCH EXISTING KEY SYSTEM	626	BE
1	EA	SURFACE CLOSER	4111 SCUSH X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HW Set # 3
For use on Door #(s):
104 105
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	CL 3120 NZD	626	C-R
1	EA	SURFACE CLOSER	4011/4111 X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J	BK	ZER
1	EA	HEAVY DUTY DOOR BOTTOM	355AA/364AA-Z49 TYPE AS REQ	AA	ZER

HW Set # 4
For use on Door #(s):
102A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	CL3155 NZD LC	626	C-R
1	EA	FSIC CORE	VERIFY AND MATCH EXISTING KEY SYSTEM	626	BE
1	EA	SURFACE CLOSER	4011/4111 X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HW Set # 5
For use on Door #(s):
102B
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	CL3155 NZD LC	626	C-R
1	EA	FSIC CORE	VERIFY AND MATCH EXISTING KEY SYSTEM	626	BE
1	EA	SURFACE CLOSER	4111 SCUSH X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488S PSA H & J (USE SILENCERS @ NON-RATED DOORS)	BK	ZER

HW Set # 6
For use on Door #(s):
101B 106 108 109
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	PANIC HARDWARE	99-L-17 LENGTH AS REQ	626	VON
1	EA	RIM CYLINDER	20-057 ICX W/KEYED CONST. CORE	626	BE
1	EA	FSIC CORE	VERIFY AND MATCH EXISTING KEY SYSTEM	626	BE
1	EA	SURFACE CLOSER	4111 SCUSH X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HW Set # 7
For use on Door #(s):
101A
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	99-NL LENGTH AS REQ	626	VON
1	EA	RIM CYLINDER	20-057 ICX W/KEYED CONST. CORE	626	BE
1	EA	FSIC CORE	VERIFY AND MATCH EXISTING KEY SYSTEM	626	BE
1	EA	SURFACE CLOSER	4111 SCUSH X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	SET	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A	A	ZER

HW Set # 8
For use on Door #(s):
107
Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	99-EO LENGTH AS REQ	626	VON
1	EA	SURFACE CLOSER	4111 SCUSH X MTG BRKT, SPCR & PLATE AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA DW + 4" (OMIT @ COVERED OPENINGS)	AA	ZER
1	SET	GASKETING	328AA H & J	AA	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A	A	ZER

-EXIT ONLY. NO ENTRY.

HW Set # 9
For use on Door #(s):
106A 107A 108A 109A 109B
Provide each RU door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	MORTISE CYLINDER	20-061 ICX W/KEYED CONST. CORE (AS REQ)	626	BE
1	EA	FSIC CORE	VERIFY AND MATCH EXISTING KEY SYSTEM (AS REQ)	626	BE
1	EA	DOOR CONTACT	674-OH	628	SCE
		NOTE	BALANCE OF HARDWARE BY DOOR Mfr		

-DOOR CONTACT FOR MONITORING. -COORDINATE HARDWARE WITH DOOR MFR.-REMOVE CYLINDER AND CORE IF NOT REQUIRED.

HW Set # 10
For use on Door #(s):
110A 110B 110C 111A 111B 111C
Provide each RU door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	EA		BALANCE OF HARDWARE EXIST-ING TO REMAIN		

HW Set # 11
For use on Door #(s):
110 111
Provide each SGL door(s) with the following:

QTY	DESCRIPTION	CATALOG NUMBER	FINISH	MFR
	NOTE	BALANCE OF HARDWARE EXIST-ING TO REMAIN		

END OF SECTION

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Monolithic Glass.
   2. Insulated Glazing Unit.
   3. Window Frost Film.

B. Related Sections:
   1. Division 08 Section “Hollow Metal Frames”.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 SUBMITTALS

A. Per Division 01 Section “Submittal Procedures”.

B. Product Data: For each glass product and glazing material indicated.

C. Glass Samples: For each type of products; 12 inches square.

D. Glazing Accessory Samples: For gaskets sealants and colored spacers, in 12-inch lengths.

E. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

F. Qualification Data: For installers and manufacturers of insulating glass units with sputter coated, low-e coatings.

G. Product Certificates: For glass and glazing products, from manufacturer.

H. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating Glass Units with Sputter Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated glass manufacturer.
B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
C. Source Limitations for Glass: Obtain patterned glass, laminated glass, and insulating glass from single source from single manufacturer for each glass type.
D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
    1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
    2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
F. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
G. Pre-installation Conference: Conduct conference per Division 01 “Project Management”.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
B. Comply with insulating glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
    1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated glass standard.
    1. Warranty Period: 10 years from date of Substantial Completion.
B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating glass manufacturer agrees to replace insulating glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning

insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. NO WIRE GLASS ALLOWED.

B. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated. Kind HS heat treated float glass, or Kind FT heat treated float glass.

B. Heat Treated Float Glass: ASTM C 1048; Type I; Quality Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated. Kind HS heat treated float glass or Kind FT heat treated float glass.

C. Fully tempered glass is indicated, provide Kind FT heat treated float glass.

D. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. PPG Industries, Inc.
   2. Guardian

2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:
   1. Neoprene complying with ASTM C 864.
   2. Silicone complying with ASTM C 1115.

2.4 GLAZING SEALANTS

A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Dow Corning Corporation; 790.
      b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
      c. Sika Corporation, Construction Products Division; SikaSil-C990.

2.5 GLAZING TAPES

A. Back Bedding Mastic Glazing Tapes: Preformed, butyl based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
   1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.7 WINDOW FROST FILM

A. Basis of Design: Huper Optik Dekorativ Frost.
   1. Thickness: 2 mil.
   2. Visible Light Transmission: 73%.
   3. Visible Light Reflectance (Interior): 20%.
   4. Visible Light Reflectance (Exterior): 26%.
   5. Shading Coefficient: 0.86.
   6. Solar Heat Gain Coefficient: 0.75.
   7. UV Light Rejection: 99%.
   8. Total Solar Energy Rejected: 25%.
   9. Glare Reduction: 19%.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
B. Clean cut or flat grind vertical edges of butt glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
C. Grind smooth and polish exposed glass edges and corners.

2.9 INSULATING GLASS TYPES

A. Glass Type A: Low-e coated, tinted tempered insulating glass.
   1. PPG Industries, Inc: Solarban 60 Tinted (2) Tempered Glass on Glass Below + Clear Glass Insulating Glass Unit

a. Tint Color: As selected by Architect from manufacturer.
2. Overall Unit Thickness: 1 inch.
3. Thickness of Each Glass Lite: 1/4 inch.
4. Outdoor Lite: Tinted fully tempered float glass.
5. Interspace Content: Air.
6. Indoor Lite: Clear float glass.
7. Low-E Coating: Second surface.
8. Provide safety glazing labeling.

2.10 MONOLITHIC-GLASS TYPES

A. Glass Type B: Clear fully tempered float glass.
1. Thickness: 1/4- inch.
2. Provide safety glazing labeling.

EXECUTION

2.11 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass framing members.
B. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning installation indicates acceptance of conditions.

2.12 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

2.13 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
G. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
K. Where wedge shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
L. Square cut wedge shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

2.14 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
C. Installation with Drive in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
D. Installation with Pressure Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
E. Install gaskets so they protrude past face of glazing stops.

2.15 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Non load bearing steel framing systems for interior gypsum board assemblies.
   2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

1.3 SUBMITTALS

A. Per Division 01 Section “Submittal Procedures”.
B. Product Data: For each type of product.
C. Per Division 01 Section “Submittal Procedures”.
D. Evaluation Reports: For dimpled steel studs and runners, from ICC-ES.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
   1. Clark Steel Framing.
   2. Custom Stud, Inc.
   3. Dietrich Metal Framing; a Worthington Industries Company.
   4. MarinoWare; a division of Ware Industries.
   5. SCAFCO Corporation.
   6. Southeastern Stud & Components, Inc.
   7. Steeler, Inc.
   8. United Metal Products, Inc.

2.2 PERFORMANCE REQUIREMENTS

A. Fire Test Response Characteristics: For fire resistance rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
B. STC Rated Assemblies: For STC rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.3 FRAMING SYSTEMS

A. Stud Framing Materials: Unless noted otherwise on drawings non load bearing rolled steel, channel shaped, punched for utility access, as follows:

1. Width: 6 inches or 3- 5/8 inches or as indicated on Drawings.
2. Thickness: 25 gauge for Interior wall, 20 gauge on Exterior walls.
    a. Install two 20-gauge studs at each jamb for the following conditions, unless otherwise indicated:
        1) Pair studs face to face, or nest together according to stud manufacturer's recommendations.
        2) Solid core wood doors equal to or greater than 3 feet 0 inches wide.
        3) Hollow metal doors equal to or greater than 3 feet 0 inches wide.
        4) Doors of any opening width where the leaf weighs more than 100 pounds.
        5) Pairs of doors of any opening width.
        6) All doors in fire rated walls and partitions.
    b. 12 gauge at walls or framing supporting shower seats and casework.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G60 (Z180) hot dip galvanized unless otherwise indicated.

C. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.
1. Steel Studs and Runners:
    a. Minimum Base Metal Thickness: As indicated on Drawings.
    b. Depth: As indicated on Drawings.
2. Dimpled Steel Studs and Runners:
    a. Minimum Base Metal Thickness: As indicated on Drawings.
    b. Depth: As indicated on Drawings.

D. Slip Type Head Joints: Where indicated, provide the following:
1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    a. Products: Subject to compliance with requirements, provide one of the following:
        1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track (Basis of Design).
        2) Steel Network Inc. (The); VertiTrack VT Series.
        3) Telling Industries: Slotted Deflection Track.

E. Cold Rolled Channel Bridging: Steel, 0.053 inch (1.34 mm) minimum base metal thickness, with minimum ½ inch wide flanges.
1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068 inch (1.72 mm) thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Minimum Base-Metal Thickness: As indicated on Drawings.
2. Depth: As indicated on Drawings.

G. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission.
1. Configuration: Asymmetrical or hat shaped, as shown on drawings.

H. Cold-Rolled Furring Channels: 0.053 inch (1.34 mm) uncoated steel thickness, with minimum 1/2-inch wide flanges.
1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated edge type of steel sheet with minimum uncoated steel thickness of 0.033 inch (0.8 mm).

3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062 inch (1.59mm) diameter wire, or double strand of 0.048 inch (1.21 mm) diameter wire.

I. Z Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.4 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062 inch (1.59-mm) diameter wire, or double strand of 0.048 inch (1.21 mm) diameter wire.

B. Hanger Attachments to Concrete:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
      a. Type: Post installed, expansion anchor.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Carrying Channels: Cold rolled, commercial steel sheet with a base metal thickness of 0.053 inch (1.34 mm) and minimum ½ inch wide flanges.
   1. Depth: As indicated on Drawings.

E. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: 0.053 inch (1.34 mm) uncoated steel thickness, with minimum 1/2 inch wide flanges, 3/4 inch deep.
   2. Steel Studs and Runners: ASTM C 645.
      a. Minimum Base Metal Thickness: As indicated on Drawings.
      b. Depth: As indicated on Drawings.
   3. Dimpled Steel Studs and Runners: ASTM C 645.
      a. Minimum Base Metal Thickness: As indicated on Drawings.
      b. Depth: As indicated on Drawings.
   4. Hat Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
      a. Minimum Base Metal Thickness: As indicated on Drawings.
   5. Resilient Furring Channels: ½ inch deep members designed to reduce sound transmission.
      a. Configuration: Asymmetrical or hat shaped, as shown on drawings.

F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct hung system composed of main beams and cross furring members that interlock.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Armstrong World Industries, Inc.; Drywall Grid Systems.
      b. Chicago Metallic Corporation; Drywall Grid System.
      c. USG Corporation; Drywall Suspension System.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:
   1. Foam Gasket: Adhesive backed, closed cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow metal frames, cast in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
B. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of Installation means acceptance of existing conditions.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
    1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
    1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
C. Install bracing at terminations in assemblies.
D. Do not bridge building control and expansion joints with non load bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacing indicated, but not greater than spacing required by referenced installation standards for assembly types.
    1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
    2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
    3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
C. Install studs so flanges within framing system point in same direction.
D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
    1. Slip Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
    2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
        a. Install two studs at each jamb unless otherwise indicated.

b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire Resistance Rated Partitions: Install framing to comply with fire resistance rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
5. Sound Rated Partitions: Install framing to comply with sound rated assembly indicated.

E. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder driven fasteners spaced 24 inches o.c.

F. Z Furring Members:
1. Erect insulation, specified in Division 07 Section "Thermal Insulation," vertically and hold in place with Z furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacing indicated, but not greater than spacing required by referenced installation standards for assembly types.
1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Do not attach hangers to steel roof deck.
4. Do not attach hangers to rolled in hanger tabs of composite steel floor deck.
5. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire Resistance Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross furring members to each other and butt cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 09 29 00 - GYPSUM BOARD SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Interior gypsum board.
B. Related Requirements:
   1. Division 09 Section "Non Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 SUBMITTALS

A. Per Division 01 Section “Submittal Procedures”.
B. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
B. Do not install paper faced gypsum panels until installation areas are enclosed and conditioned.
C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire Resistance Rated Assemblies: For fire resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
B. STC Rated Assemblies: For STC rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
B. Long Edges: Tapered.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers for Gypsum Board and Accessories: Subject to compliance with requirements, provide products by one of the following:
   1. Georgia-Pacific Gypsum LLC.
   2. National Gypsum Company.
   3. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M; 5/8 inch thick.

C. Fire Rated Gypsum Board, Type X: ASTM C 1396, fire resistant type, UL rated; 5/8 inch thick.

D. Gypsum Ceiling Board: ASTM C 1396; 1/2 inch thick.

E. High Impact-Resistant Gypsum Board: Type X ASTM C 1629; 5/8 inch thick; Impact Level 3.

F. Moisture and Mold Resistant Gypsum Board: ASTM C 1396; 5/8 inch thick; Mold Resistance: ASTM D 3273, score of 10.

G. Tile Backing Panels; Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325; 5/8 inch thick Mold Resistance: ASTM D 3273, score of 10.

2.4 ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Paper faced galvanized steel sheet.
   2. Shapes:
      a. Corner bead. Use at outside corners unless otherwise indicated.
      b. LC Bead: J shaped; exposed long flange receives joint compound. Use at exposed panel edges.
      c. L Bead: L shaped; exposed long flange receives joint compound. Use where indicated.
      d. Expansion (control) joint. Install control joints according to ASTM C 840 or per manufacturer’s recommendations.

B. Joint Treatment Materials: Comply with ASTM C 475; reinforcing tape, joint compound, adhesive, water, and fasteners.

C. Texture Finishes: Non-Aggregate Finish; spray application. Prime as recommended by manufacturer. Texture: Orange Peel.

D. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

E. Steel Drill Screws: ASTM C 1002, unless otherwise indicated or recommended by manufacturer.

F. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire Resistance Rated Assemblies: Comply with mineral fiber requirements of assembly.

G. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

H. FRP: Provide and install 4’-0” high water resistant gypsum board covered by white FRP, including terminations and edge banding as required, at all walls surrounding mop sinks in Janitor Closets.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including, for compliance with requirements and other conditions affecting performance.
B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
C. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of Installation means acceptance of existing substrate and conditions.

3.2 INTERIOR GYPSUM BOARD INSTALLATION

A. Install each type of interior gypsum board where indicated on Drawings.
B. Comply with ASTM C 840 and manufacturer’s instructions.
C. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.
D. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
E. Use screws when fastening gypsum board to metal framing.
F. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum ceiling board with sealant.
G. Place control joints consistent with lines of building spaces where indicated or as directed.
H. Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board abutts dissimilar materials where indicated.
I. STC Rated Assemblies: Comply with ASTM C 919 and with manufacturer's instructions.
J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 FINISHING GYPSUM BOARD

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
B. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
C. Install in accordance with manufacturer's instructions.

3.4 TOLERANCES

A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

3.5 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION

SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Acoustical Panels.
   2. Exposed suspension systems for ceilings.

1.3 SUBMITTALS

A. Per Division 01 section “Submittal Procedures”.
B. Product Data: For each type of product indicated.
C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
   1. Ceiling suspension system members. Method of attaching hangers to building structure. Size and location of initial access modules for acoustical panel. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).
D. Samples for Selection: For components with factory applied color finishes.
E. Qualification Data: For testing agency.
F. Field quality control test reports.
G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
H. Research/Evaluation Reports: For acoustical panel ceiling and components.
I. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP accredited laboratory, with the experience and capability to conduct the testing indicated. NVLAP accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.
B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
C. Fire Test Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
   1. Fire Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
      a. Fire Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
      b. Identify materials with appropriate markings of applicable testing and inspecting agency.

2. Surface Burning Characteristics: Provide acoustical panels with the following surface burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
   a. Smoke Developed Index: 450 or less.

D. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to ASTM E 580.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

F. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Panel cartons are to show a label Classified with UL label on product carton

B. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

C. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

D. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   1. Temperature is between 32°F and 120°F. It is not necessary for the area to be enclosed or for HVAC systems to be functioning. All wet work (plastering, concrete, etc) must be complete and dry.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire suppression system, and partition assemblies.

1.8 EXTRA MATERIALS (MAINTENANCE MATERIAL SUBMITTALS)

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Units: Full size panels equal to 2.0 percent of quantity installed.
   2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2.0 percent of quantity installed.
   3. Hold Down Clips: Equal to 2 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

A. Refer to Finish Legend and Room Finish Schedule for final material selections.
B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance, unless otherwise indicated.
   1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.2 ACOUSTICAL PANELS – ACT 2

A. Basis-of-Design Products: Subject to compliance with requirements, provide one of the following:
   1. USG: 4753 Olympia Micro Panels 60 NRC.
   2. Armstrong World Industries, Inc.; MESA, 684.
B. Surface Texture: Fine
C. Composition: Mineral Fiber
D. Color: White
E. Size: 24 inch x 48 inch x 3/4 inch.
F. Edge Profile: Angled Tegular 15/16IN for interface with Prelude XL 15/16" Exposed Tee grid.
G. Noise Reduction Coefficient (NRC): ASTM C 423; Classified with UL label on product carton, 0.60.
H. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton, 35
I. Flame Spread: ASTM E 1264; Class A Fire Resistive
J. Light Reflectance (LR): ASTM E 1477; White Panel: Light Reflectance: 0.85.
K. Dimensional Stability: HumiGuard Plus.
L. Recycle Content: Post-Consumer - 1% Pre-Consumer - 44% - 46%

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Grids:
   1. Basis-of-Design Products: Subject to compliance with requirements, provide one of the following:
      a. USG; DX/DXL 15/16” Tee System.
      b. Armstrong World Industries, Inc.; Prelude XL 15/16” Exposed Tee System.
      c. Grids are to be from the same manufacturer of the ceiling tile or as approved by the ceiling tile manufacturer.
   2. Color: White.
B. Decorative Ceiling Trim:
   1. Basis-of-Design Products: Subject to compliance with requirements, provide one of the following:

a. USG: Compasso.
b. Armstrong World Industries, Inc.: Axiom.

2. Heights: 8- inch or as indicated on Drawings.
3. Color: As indicated on Drawings.

C. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

D. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory applied finish for type of system indicated.

E. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

F. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc Coated, Carbon Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106 inch diameter wire.

G. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

H. Hold Down Clips: Where indicated, provide manufacturer's standard hold down clips spaced 24 inches o.c. on all cross tees.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
1. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Testing Substrates: Before installing adhesively applied panels on wet placed substrates such as cast in place concrete or plaster, test and verify that moisture level is below panel manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less than half width panels at borders, and comply with layout shown on reflected ceiling plans.

C. Layout ceiling grid such that no main runners are installed beneath mechanical ductwork fire damper access doors. Only easily removable cross tees may be installed beneath access doors. Coordinate work with mechanical trades and, where possible, from mechanical ductwork shop drawings. Inform Architect before installing any ceiling grid which appears to have a conflict, so adjustments can be made in ceiling grid, lighting fixture, and diffuser designs and layout.

3.3 INSTALLATION, SUSPENDED ACOUSTICAL PANEL CEILINGS

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
   1. Fire Rated Assembly: Install fire rated ceiling systems according to tested fire rated design.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast in place hanger inserts, post installed mechanical or adhesive anchors, or power actuated fasteners that extend through forms into concrete.
   6. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
   7. Do not attach hangers to steel deck tabs.
   8. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   9. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   10. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast in place or post installed anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical panel ceiling area and where necessary to conceal edges of acoustical panels.
   1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
   2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
   3. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical panels as follows:
   1. As indicated on reflected ceiling plans.
   2. For square edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3. Install hold down clips in areas indicated in Room Finish Schedule, or in areas required by authorities having jurisdiction,

G. Install acoustical panels in coordination with suspension system and exposed moldings and trim.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Engage a qualified special inspector to perform the following special inspections and prepare reports:
   1. Suspended ceiling system.
   2. Hangers, anchors and fasteners.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Tests and Inspections: Testing and inspecting of completed installations of acoustical panel ceiling hangers and anchors and fasteners shall take place in successive stages, in areas of extent and using methods as follows. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.
   1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.

D. Remove and replace acoustical panel ceiling hangers and anchors and fasteners that do not pass tests and inspections and retest as specified above.

3.5 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace panels and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage as determined by Architect.

END OF SECTION

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Resilient base.
   2. Resilient Stair Accessories.

1.3 SUBMITTALS

A. Per Division 01 section “Submittal Procedures”.
B. Product Data: For each type of product indicated.
C. Samples for Initial Selection: For each type of resilient base indicated.
D. Maintenance Data: For each type of resilient base to include in maintenance manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store base installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.5 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.
B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Resilient Base: Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base and Transition Strips:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Basis of Design: Johnsonite.
b. Armstrong World Industries, Inc.
c. Roppe Corporation

B. Resilient Base Standard: ASTM F 1861.
1. Material Requirement: Type TP (rubber, thermoplastic).
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: Cove (base with toe).

C. Minimum Thickness: 0.125 inch.
D. Height: 4 inches.
E. Lengths: Coils in manufacturer's standard length.
F. Outside Corners: Preformed.
G. Inside Corners: Job formed.
H. Finish: As indicated on Drawings or selected by Architect from manufacturer's full range.
I. Colors and Patterns: As indicated on Drawings or selected by Architect from full range of industry colors.

2.2 RESILIENT STAIR ACCESSORIES

A. Resilient Stair Tread Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flexco, Inc.
2. Johnsonite.
3. Roppe Corporation, USA.

B. Resilient Stair Treads Standard: ASTM F 2169.
1. Material Requirement: Type TP (rubber, thermoplastic).
2. Surface Design:
a. Class 2, Pattern: Raised-disc design, or As Selected by Architect from Manufacturers full range.
3. Manufacturing Method: Group 2, tread with contrasting color for the visually impaired.

C. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
D. Nosing Height: 1-1/2 inches (38 mm).
E. Thickness: 1/4 inch (6 mm) and tapered to back edge.
F. Size: Lengths and depths to fit each stair tread in one piece.
G. Risers: Smooth, flat, [coved-toe, 7 inches (178 mm) high by length matching treads] [toeless, height and length to cover risers]; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
H. Thickness: 0.125 inch (3.2 mm).
I. Stringers: Of same thickness as risers, height and length after cutting to fit risers and treads and to cover stair stringers; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
J. Colors and Patterns: As selected by Architect from full range.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex modified, portland cement based or blended hydraulic cement based formulation provided or approved by manufacturer for applications indicated.
B. Adhesives: Water resistant type recommended by manufacturer to suit base and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
C. Proceed with installation only after unsatisfactory conditions have been corrected. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
C. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.
B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
E. Do not stretch resilient base during installation.
F. Preformed Corners: Install preformed corners before installing straight pieces.
G. Job-Formed Corners:
    1. Inside Corners: Use straight pieces of maximum lengths possible.
H. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
B. Perform the following operations immediately after completing floor tile installation:
    1. Remove adhesive and other blemishes from exposed surfaces.
    2. Sweep and vacuum surfaces thoroughly.
    3. Damp mop surfaces to remove marks and soil.
C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

END OF SECTION

SECTION 09 90 00 – PAINTS AND COATING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Furnish all materials, labor and equipment necessary for the completion of all painting throughout the Project.
   1. It is the intent of this Section to require the field painting of all unfinished interior and exterior items included in the Project to include new rooftop mounted equipment, flashing and vents.
   2. The Contractor, or Painting Subcontractor, shall thoroughly examine the full Contract Documents to determine the extent of painting that is required. Through submission of his bid, the Contractor attests that he has identified all materials and items which are left unfinished by other trades and necessitate painting. This Section does not require painting of factory pre-finished items or prime coats on factory primed items.

1.3 SUBMITTALS

A. Provide per Division 01 Section “Submittal Procedures”.
B. The Contractor shall submit the following product data:
   1. Submit complete list of products proposed for use at least thirty (30) days prior to commencement of painting work. (Intent of Contractor to use products specified does not relieve him from responsibility of submitting product list).
   2. Indicate manufacturer, brand name, quality and type paint for each surface to be finished.
C. The Contractor shall submit the following color samples:
   1. Following color selection or issuance of color schedule, prepare actual brush-out samples of each paint, stain or finish actually required for use on the project.
   2. Submit 8" x 10", brush out samples in duplicate. Apply products in number of coats specified for actual work.

1.4 SAFETY PRECAUTIONS

A. The Contractor shall adhere to the following safety precautions:
   1. Provide temporary fire protection equipment in materials storage area.
   2. Prohibit smoking in storage area.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain primers, paints, and stains through one source from a single manufacturer.
   1. The primer and paint are to be from the same manufacturer to create a total system from one manufacturer.
B. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
   a. Vertical and Horizontal Surfaces: Provide samples of 8- inches by 8- inches.
   b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Applicator shall be approved by paint manufacturer in writing. Approval shall indicate the following:
   1. Manufacturer has instructed applicator in the installation of specified material.
   2. Applicator has been engaged in satisfactory application of materials on project of similar scope for at least three years.

D. The following standards of quality shall apply:
   1. Prior to production application of paint coatings a "Standard of Quality" application shall be prepared for inspection and acceptance by the Architect and the Owner. Said application shall be made on a representative area of the project with the approved coatings applied in accordance with this specification by the coatings applicator.
   2. A representative of the manufacturer of the special coatings shall be present at the job site to observe this application, inspect surfaces and conformance to specification.
   3. Upon completion of this sample application, a representative of the Contractor, the manufacturer and the Architect and Owner shall inspect and approve this area. Upon acceptance said area shall become the "Standard of Quality" for subsequent coatings application, and the application contractor shall be responsible for maintaining the accepted quality throughout the subsequent application.
   4. For painting of previously painted surfaces the paint manufacturer's representative shall determine the recommended coating with concurrence of the Architect.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint, enamel, varnish, stains and other materials shall be of the type and quality specified in the Schedule of Finishes.

B. Basic painting materials such as linseed oil, shellac, turpentine, thinners, etc. shall be of the highest quality and shall have identifying labels on containers.
C. All paint materials shall be delivered to the site in manufacturer's sealed containers with the manufacturer's label stating brand, type of paint, color and instruction for thinning. Thinning shall be done only in accordance with the manufacturer's instructions.
D. Bids will be based on paint products of the quality specified and produced by an approved manufacturer. The use of specific manufacturer's products in the Schedule of Finishes is not intended to limit competition but to define quality of finish required. The Contractor will submit to the Architect a list of manufacturers whose products are to be used on the project.
E. All products shall be the highest quality of Manufacturers' line of products.
F. All primers and finish products shall be totally lead free.
G. All finish materials shall be compatible with primers; particularly needed where materials are shop primed.

2.2 COLORS AND SAMPLES

A. Colors are to be selected by the Architect. Different colors may be selected in each room. The Architect will prepare and furnish a color schedule to the Contractor. First coats of paint are to be tinted toward the final color and the Architect may make changes in the tint of the final coat after inspection of appearance of first coat.
B. Prepare samples of wood finishes for approval prior to finishing installed materials.
C. Paint and stain colors shall be as scheduled with final approval based on brush out sample submittal.
D. Primers are to be tinted based on the top coat color as recommended by Manufacturer.

2.3 MANUFACTURER

A. Manufacturer: Subject to compliance with requirements, provide products of the following:
   1. Basis of Design: Sherwin Williams Company.
   2. Pittsburgh Paints (PPG).
   3. Benjamin Moore.
B. Products specified herein are as manufactured by the listed companies, and shall be the basis for the standard of quality. Products of other acceptable manufacturers specified, similar in material, type and quality, may be acceptable for use subject to approval of specified product data submittal. All products shall be the manufacturers' highest quality products.
C. Where products other than those of the manufacturer listed as the standard of quality are specified in Painting Schedule, such products have been selected to achieve specific results and substitutions will be allowed only in accordance with product options and substitutions section.
D. Miscellaneous materials:
   1. Paint thinners and tints shall be products of same manufacturer as paints or approved by him for use with his products.
   2. Lacquers, turpentine, patching compounds and similar materials required for execution of work shall be compatible with painting materials and surfaces applied.

2.4 MAINTENANCE MATERIALS

A. Furnish minimum five (5) percent or one (1) gallon of each paint color and finish used on project for the Owner, whichever is greater.
B. Properly identify each container with manufacturer, color name, product number, and color formula.
C. Store materials at location designated by Owner.

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES

A. Inspect all surfaces which are to receive field finish and notify the General Contractor of any surface not in proper condition to receive paint. Starting work will constitute acceptance of preceding work and assumption of full responsibility for obtaining satisfactory finish.
B. Surfaces which are to be repainted shall be thoroughly cleaned prior to painting. Loose or poorly bonded paint shall be scraped or otherwise removed. Roughen existing paint to receive new paint to insure a tight bond.

3.2 WORKMANSHIP

A. The number of coats of the various finishes specified in the Schedule of Finishes will produce first quality finishes, if properly applied. If the number of coats specified fails to produce a finish acceptable to the Architect, the Painting Contractor shall applied additional coat at his own expense until an acceptable finish is obtained.
B. Before painting remove all hardware, plates, and accessories, light fixtures, etc. or adequately protect them during painting. Replace removed items upon completion of the various stages of work. Use skilled mechanics for the removal and replacement of items. During the progress of the work, protect all painting work and the work of others against damage.
C. Clean all surfaces prior to finishing according to the recommendations of the paint manufacturer, removing all grease, dirt, etc. Surface to be finished shall be clean, dry, smooth and adequately protected against dampness. Touch up knots and resinous spots in wood with shellac. Putty nail holes, cracks and blemishes in wood after priming or staining. Match putty to shade of finish coat. Sand and dust between all coats of finish on natural finish wood items.
D. All work is to be performed under favorable weather conditions. Each coat of paint shall be applied smoothly, worked out evenly, and allowed to dry completely before the subsequent coat is applied. Comply with manufacturer's written instructions for drying time between coats. Finished work shall be uniform and of the approved color. It shall completely cover, be smooth and free from runs, holidays, sags, clogging or excessive flooding. Edges of paint adjoining other materials or colors shall be sharp and clean without overlapping.
E. All wood surfaces not exposed to view which require sealers, such as drawers and interior cabinets shall be sealed with a sealer with a light red tint.
F. Surfaces to receive finishes shall be dry and free of debris, oils, dust or other deleterious materials. Before application of coatings, quality assurance inspection shall have been performed and approved by the paint manufacturer.
G. Treat mildewed surfaces with a solution of one quart hypochlorite bleach with 2 ounces of tri-sodium phosphate to one gallon water. Rinse and allow to dry prior to painting.
H. Sand and dust between coats to remove visible defects when viewed from a distance of 5'.
I. Ensure finish coats shall be smooth, free of brush marks, streaks, laps or pileup of paint, skipped or missed areas.
J. Back prime finish carpentry and millwork with material specified for prime coat, without runs on face. Finish cut edges prior to installation.
K. Paint inside of ductwork flat black for entire area visible through ceiling openings. Paint underside of ductwork and other above ceiling items flat black for entire area visible through ceiling openings.

3.3 CLEAN-UP

A. At completion, clean all paint spots from work, touch up and restore finish where damaged, remove surplus materials and leave entire job clean and acceptable to the Architect.

3.4 SCHEDULE OF FINISHES

A. The following Specification for finishes is not intended to mention every particular item which will receive painter's finish, but is intended to establish type and quality of finish which will be required on various materials.

B. Interior Work: (Refer drawings for specific finish locations)

1. Natural Finish Wood – Doors, cabinets, trim, and panels.
    a. Finish: Two (2) coats Sherwin Williams WoodClassic Polyurethane Varnish Satin MPI# 57.
2. Stained Finish Wood – Doors, cabinets, trim, and panels.
    a. Stain: One (1) coat Sherwin Williams WoodClassics Oil Stain A49 Series MPI# 90.
    b. Finish: Two (2) coats Sherwin Williams WoodClassics Polyurethane Varnish Satin or Gloss.
3. Painted Wood – Cabinets, trim, masonite.
    a. Primer: One (1) coat Sherwin Williams Premium Wall & Wood Inteiror Latex Primer B28W811 (<50g/L).
    b. Finish: Two (2) coats Sherwin Williams Promar 200 Alkyd Semi-gloss A34W251, WFT 3.6 mils per coat MPI # 47, Two (2) coats Flame Control 40/40 Semi gloss Fire Retardant Paint where required.) MPI# 67.
4. Gypsum Drywall – Walls, Fur downs, and Ceilings
    a. Wall Texture: USG Multi-Purpose "Orange peel" effect created with spray gun application.
    b. Primer: One (1) coat Sherwin-Williams ProMar 200 Zero VOC Interior Latex Primer B28W2600. MPI # 50 (< 0g/L).
    c. Finish: Two (2) coats Sherwin-Williams ProMar 200 Zero VOC Interior Latex Eg-Shel B20-2600 Seriers MPI# 52(< 0g/L).
5. Gypsum Drywall – Toilets
    a. Wall Texture: USG Multi-Purpose "Orange peel" effect created with spray gun application.
    b. Primer: Primer: One (1) coat Sherwin-Williams Pro Mar 200 Zero VOC Interior Latex Primer B28W2600 MPI# 50(< 50g/L).
    c. Finish: Two (2) coats Sherwin Williams ProIndustrial Precatalyzed Water based Epoxy Semi Gloss K46-150(< 50g/L).
6. Dry Erase Paint
    a. Install per manufacturer’s instructions.
    b. Primer: IdeaPaint Primer.
    c. Patching compound: Manufacturer’s recommended compound (NOT JOINT COMPOUND)
    d. Two (2) coats Primer for dry erase paint: IdeaPaint Primer.
    e. IdeaPaint CREATE white.
7. Hollow Metal Frames and Doors (Factory Primed)
    a. Primer: Spot Prime Bare Metal, One (1) coat Sherwin Williams Pro Industrial Pro-Cryl Universal Primer B66-310 series. MPI# 107
    b. Finish: Two (2) coats Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss B53-1150 Series, WFT 4.0 mils per coat.

c. NOTE: Spot prime abraded areas.

8. Exposed Structural Steel – Ceiling, beams, girders, joists
   a. Primer: One (1) coat Sherwin Williams Pro Industrial Pro-Cryl Universal Primer B66-310 series. MPI# 107
   b. Finish: Two (2) coats Sherwin-Williams Waterborne Acrylic Dry Fall B42W82 Eg-Shel B42W2. MPI#155.
9. Existing painted concrete block – Walls
   a. Primer: One (1) coat Sherwin Williams PrepRite Block Filler B25W25. MPI# 4
   b. Finish: Two (2) coats Sherwin Williams ProMar 200 Zero VOC Interior Latex Eg-Shel B20-2600 Series MPI# 52(<0g/L).

C. Exterior Work:
1. Ferrous Metals – Steel, hollow metal doors and frames.
   a. Primer: Spot Prime bare metal, One (1) coat Sherwin Williams Pro Industrial Pro-Cryl Universal Primer B66-310 series. MPI# 107
   b. Finish: Two (2) coats Sherwin Williams Industrial Urethane Alkyd Enamel B54-150
2. Galvanized Metals – Flashing, fascia, vents.
   a. Primer: One (1) coat Sherwin Williams Pro-Cryl Universal Primer B66-310 MPI# 107
   b. Finish: Two (2) coats DTM Acrylic Gloss B66W100 Series. MPI# 154
   c. NOTE: Surface must be free from grease, dirt, rust, and all other surface contaminants. All rust spots must be properly cleaned and primed.
3. Aluminum
   a. Finish: Two (2) coats Pro Industrial DTM Acrylic Gloss B66W01251 Series. MPI# 151, 161
   b. NOTE: Surface must be free from grease, dirt, rust, and all other surface contaminants. All rust spots must be properly cleaned and primed.
4. Exterior Wood Trim
   a. Primer: One (1) coat Sherwin Williams Exterior Oil-Based Wood Primer Y24W20. MPI# 5
   b. Finish: Two (2) coats Sherwin Williams A-100 Latex Satin A82 Series, WFT 4.0 mils per coat. MPI# 15
5. Exterior Concrete Structure
   a. Clean and prime per paint manufacture’s recommendation A-100 Satin A82 series.

END OF SECTION

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Dimensional characters.
   2. Plaques.
   3. Panel signs.
   4. Digitally printed graphics on Aluminum Composite Material.

B. Related Sections include the following:
   1. Division 01 Section "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.
   2. Division 15 Section "Identification for Plumbing Piping and Equipment" for labels, tags, and nameplates for plumbing systems and equipment.
   3. Division 15 Sections " Identification for HVAC Piping and Equipments" for labels, tags, and nameplates for HVAC systems and equipment.
   4. Division 16 Sections for electrical service and connections for LED signs.
   5. Division 16 Section "Identification for Electrical Systems" for labels, tags, and nameplates for electrical equipment.
   6. Division 26 Section "Lighting" for illuminated Exit signs.

1.3 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for signs.
   1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
   2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
   3. Wiring Diagrams: Power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
   1. Aluminum.
   2. Acrylic sheet.
   3. Polycarbonate sheet.
   4. Fiberglass sheet.
   5. Die cut vinyl characters and graphic symbols. Include representative samples of available typestyles and graphic symbols.

D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
   1. Plaque Casting: 6 inches square including border.
   2. Dimensional Characters: Full size Samples of each type of dimensional character (letter, number, and graphic element).
   3. Aluminum: For each form, finish, and color, on 6 inch long sections of extrusions and squares of sheet at least 4 by 4 inches.
   4. Acrylic Sheet: 8 by 10 inches for each color required.
   5. Polycarbonate Sheet: 8 by 10 inches for each color required.
   6. Fiberglass Sheet: 8 by 10 inches for each color required.
   7. Panel Signs: Not less than 12 inches square.
   8. Photoluminescent Signs: Full size sign.
   9. Accessories: Manufacturer's full size unit.

E. Sign Schedule: Use same designations indicated on Drawings.

F. Qualification Data: For Installer and fabricator.

G. Maintenance Data: For signs to include in maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products or an employer of workers trained and approved by manufacturer.

B. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

C. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.

D. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of signs in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate placement of anchorage devices with templates for installing signs.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:

a. Deterioration of metal finishes beyond normal weathering.
b. Deterioration of embedded graphic image colors and sign lamination.

2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
B. Aluminum Sheet and Plate: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.
C. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.
D. Bronze Castings: ASTM B 584, Alloy UNS No. C86500 (No. 1 manganese bronze).
E. Bronze Plate: ASTM B 36/B 36M.
F. Acrylic Sheet: ASTM D 4802, Category A-1 (cell cast sheet), Type UVA (UV absorbing).

2.2 DIMENSIONAL CHARACTERS

A. Basis of Design Product: Subject to compliance with requirements, provide the following:
   1. Gemini Sign Letters.
B. Cast Characters: Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free of pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs where indicated on Drawings. Cast lugs into bottom of characters and tap to receive threaded mounting studs where indicated on Drawings. Alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated. Comply with the following requirements.
   1. Character Material: Aluminum.
   2. Thickness: As shown on Drawings.
   3. Color(s): As shown on Drawings.
   4. Mounting: As shown on Drawings.
      a. Flush.
      b. Projected Spacer Mount.
C. Dimensional Character Sign Schedule:
   1. Sign Type: 7
      a. Sign Size: As shown on Drawings.
      b. Character Size: As shown on Drawings.
      c. Text/Message: As selected by Owner. Coordinate with Owner prior to ordering sign.
      d. Location: As indicated.
      e. Font: As shown on Drawings.

2.3 PLAQUES

A. Basis of Design Product: Subject to compliance with requirements, provide the following:
   1. A.R.K. Ramos.
   2. Metal Arts; Div. of L&H Mfg. Co.
B. Cast Plaques: Provide castings free of pits, scale, sand holes, and other defects, as follows:

1. Plaque Material: Aluminum.
2. Background Texture: Manufacturer's standard matte texture.
3. Border Style: As indicated on Drawings.
4. Mounting: Concealed studs, non-corroding for substrates encountered.

C. Plaque Schedule:
1. Plaque Type: Sign Types 4
   a. Plaque Size: As indicated.
   b. Character Size: As indicated.
   c. Character Finish/Color: As indicated.
   d. Text/Message: As indicated.
   e. Location: As indicated.
   f. Room: As indicated.
   g. Quantity: As indicated.

2.4 PANEL SIGNS

A. Basis of Design Product: Subject to compliance with requirements, provide the following:
1. Best Sign Systems Inc.

B. Subject to compliance with requirements, acceptable alternate manufacturer:
1. ASI-Modulex, Inc.

C. Interior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:
1. Acrylic Sheet: 0.060 inch thick.
2. Edge Condition: Beveled.
3. Corner Condition: Rounded to radius indicated.
4. Mounting: Unframed.
   a. Wall mounted with concealed anchors.
   b. Manufacturer's standard anchors for substrates encountered.
5. Color: As selected by Architect from manufacturer's full range.
6. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch above surface with contrasting colors.

D. Brackets: Fabricate brackets and fittings for bracket mounted signs from extruded aluminum to suit panel sign construction and mounting conditions indicated. Factory paint brackets in color matching background color of panel sign.

E. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of transparent covers with paper inserts printed by Owner.
1. Furnish insert material and software for creating text and symbols for PC-Windows and Macintosh computers for Owner production of paper inserts.
2. Furnish insert material cut to size for changeable message insert.

F. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
1. Panel Material: Opaque acrylic sheet.
2. Raised Copy Thickness: Not less than 1/32 inch.

G. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth.
1. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.
2. Engraved Metal: Fill engraved copy with enamel.

3. Engraved Opaque Acrylic Sheet: Fill engraved copy with enamel.
4. Face Engraved Clear Acrylic Sheet: Fill engraved copy with enamel. Apply opaque background color coating to back face of acrylic sheet.

H. Subsurface Copy: Apply minimum 4 mil thick vinyl copy to back face of clear acrylic sheet forming panel face to produce precisely formed opaque image. Image shall be free of rough edges.

I. Subsurface Engraved Acrylic Sheet: Reverse engrave back face of clear acrylic sheet. Fill resulting copy with enamel. Apply opaque background color coating over enamel filled copy.

J. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and are UV and water resistant for five (5) years for application intended.
1. Color: As selected by Architect from manufacturer's full range.

K. Panel Sign Schedule:
1. Sign Type 1, 2, 3, and 8:
a. Sign Size: As indicated.
b. Message Panel Material: As indicated.
c. Message Panel Finish/Color: As selected by Architect from manufacturer's full range.
d. Background Finish/Color: As selected by Architect from manufacturer's full range.
e. Character Size: As indicated.
f. Character Finish/Color: As selected by Architect from manufacturer's full range.
g. Text/Message: As indicated.
h. Location: As indicated.
i. Room: As indicated.
j. Quantity: As indicated.

2.5 DIGITALLY PRINTED GRAPHICS ON ALUMINUM COMPOSITE MATERIAL

A. Digitally printed graphics mounted to 3 mm Aluminum Composite Material. Mount it with self tapping screws on metal (screw heads painted to match) masonry screws for brick with heads painted to match substrate cut / routed to shape.

B. Panel Sign Schedule:
1. Sign Type 5 and 6:
a. Sign Size: As indicated.
b. Location: As indicated.
c. Room: As indicated.
d. Quantity: As indicated.

2.6 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous metal or hot dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.7 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
3. Preassemble signs in the shop to greatest extent possible. Disassemble signs only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation, in location not exposed to view after final assembly.
4. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: Manufacturer's standard Class 1 clear anodic coating, 0.018 mm or thicker, over a polished (buffed)] mechanical finish, complying with AAMA 611.
B. Color Anodic Finish: Manufacturer's standard Class 1 integrally colored or electrolytically deposited color anodic coating, 0.018 mm or thicker, in black or as shown on Drawings applied over a satin (directionally textured) or as shown on Drawings mechanical finish, complying with AAMA 611.
C. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate fluoride phosphate conversion coating; Organic Coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
   1. Organic Coating: Thermosetting, modified acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm), medium gloss.

2.10 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
B. Factory Priming for Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
   1. Shop Primer: Manufacturer's or fabricator's standard, fast curing, lead and chromate free, universal primer, selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field applied finish paint system indicated, and for capability to provide a sound foundation for field applied topcoats despite prolonged exposure.

C. Baked Enamel Finish: Immediately after cleaning and pre-treating, apply manufacturer's standard two coat, baked enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

2.11 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy and background colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five (5) years for application intended.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
B. Verify that items, including anchor inserts, and electrical power are sized and located to accommodate signs.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
    1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
    2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.
B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
    1. Two Face Tape: Mount signs to smooth, nonporous surfaces. Do not use this method for vinyl covered or rough surfaces.
    2. Hook and Loop Tapes: Mount signs to smooth, nonporous surfaces.
    3. Magnetic Tape: Mount signs to smooth, nonporous surfaces.
    4. Silicone Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
    5. Shim Plate Mounting: Provide 1/8 inch thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.
    6. Mechanical Fasteners: Use non-removable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
    7. Signs Mounted on Glass: Provide matching opaque plate on opposite side of glass to conceal mounting materials.
C. Bracket Mounted Signs: Provide manufacturer's standard brackets, fittings, and hardware for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings

securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.

D. Cast Metal Plaques: Mount plaques using standard fastening methods to comply with manufacturer's written instructions for type of wall surface indicated.
   1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick setting cement.
   2. Face Mounting: Mount plaques using exposed fasteners with rosettes attached through face of plaque into wall surface.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION

SECTION 10 26 00 – WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Corner guards.
   2. Wall Covering.

1.2 SUBMITTALS

A. Per Division 01 Section “Submittal Procedures”.
B. Submit Product Data and material Samples.

1.3 QUALITY ASSURANCE

A. Provide components identical to those tested according to ASTM E 84 with a flame-spread rating of 25 or less and smoke developed rating of 450 or less. Identify components with appropriate markings from testing agency.
B. Provide components with minimum Izod impact resistance of 25.4 lb/in. when tested according to ASTM D 256.

PART 2 - PRODUCTS

2.1 CORNER GUARDS

A. Manufacturers
   1. Basis of Design Products:
      a. Kitchen Corner Guards:
         1) Construction Specialties, Inc. (C/S); Model **CO-8** stainless steel corner guard.
      b. All other Corner Guards:
         1) Construction Specialties, Inc. (C/S); Model **SSM-20AN**.
   2. Other Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
      a. Construction Specialties, Inc. (C/S)
      b. Koroseal.
      c. IPC Walla and Door Protection Systems; InPro Corporation
      d. Pawling Corporation.
      e. WallGuard.Com of Dover Plains, New York (877)-943-682
B. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90 or 135 degree turn to match wall condition.
   1. Covers to be extended from high impact vinyl acrylic with a minimum impact resistance of 1.2 inch pounds per .001" of thickness when tested to ASTM D-4226. Vinyl acrylic extrusions are to be compounded with an anti-microbial additive and are chemical and stain resistant.
   2. Retainers: Aluminum extrusions are to be 6063-T5 mill finish alloy.

3. End returns and corners to be molded from tough, high impact polymers. With embossed pebble matte surface in standard colors as specified by the architect.
4. Wall Corner Guards to be .060 inches in thickness, embossed pebble matte finish, in colors as selected by the architect from manufacturer's full range.
    a. Locations: As indicated on Drawings. Where not indicated on Drawings, provide at all outside corners of gypsum board walls.
    b. Length: As indicated on Drawings. Where not indicated on Drawings, provide 4-foot tall corner guards that start at the top of the base, or as approved by the architect.
    c. Provide matching top caps for any corner guard not extending to and terminating at ceiling, ceiling break, or overhanging countertop.
5. Class 1 Fire Ratings. Flame spread to be less than 25 and smoke to be less than 450 when tested to UL 723, ASTM E-84, UBC 42-1, NFPA 255 to be ASTM D-635: Self Extinguishing.

C. Surface-Mounted, Metal Corner Guards Stainless Steel: Fabricated from one-piece, formed or extruded metal with formed edges; with 90- or 135-degree turn to match wall condition.
1. Material: Stainless steel, Type 304.
    a. Thickness: 16 gauge.
    b. Finish: Satin, No. 4.
2. Wing Size: Nominal 2 inch x 2 inch.
3. Corner Radius: 1/8 inch.
4. Mounting: Oval head, countersunk screws through factory-drilled mounting holes.

2.2 WALL COVERING

A. Manufacturers
1. Basis of Design Products:
    a. WallGuard.Com of Dover Plains, New York (877)-943-682
        1) Aluminum Diamond Plate Wall Covering.
2. Other Available Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
    a. Construction Specialties, Inc. (C/S)
    b. Koroseal.
    c. IPC Walla and Door Protection Systems; InPro Corporation
    d. Pawling Corporation.
    e. WallGuard.Com of Dover Plains, New York (877)-943-682

B. Diamond Plate multi- purpose aluminum sheets can be utilized for wall protection.
1. 11 gauge (.125" or 1/8" thick).
2. #3003 Bright Finish
3. Adhesive: Wallguard.com model ADH3.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install level, plumb, and true to line without distortions. Provide all brackets, flanges, fittings, and anchors required for complete installations.

B. Where splices occur in horizontal runs more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run.

END OF SECTION

SECTION 10 28 13 – TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Washroom accessories.
   2. Custodial accessories.
B. Related Sections:
   1. Division 09 Section "Thinset Tiling" for ceramic toilet and bath accessories.

1.3 SUBMITTALS

A. Per Division 01 section “Submittal Procedures”.
B. Product Data: For each type of product indicated.
C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.
D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WASHROOM ACCESSORIES

A. Basis of Design Product: Subject to compliance with requirements, provide by one of the following:
   1. Bobrick Washroom Equipment, Inc.
   2. Bradley Corporation. Basis of Design:

B. Scald Guards/ Under Sink Insulated Protectors:
   1. Provide on any exposed P-traps and exposed hot water supply per ADA requirements.
C. Paper Towel Dispenser: **Owner Provided, Contractor Installed.**
D. Toilet Tissue (Roll) Dispenser: **Owner Provided, Contractor Installed.**
E. Liquid Soap Dispenser: **Owner Provided, Contractor Installed.**
F. 18” Grab Bar:
   1. Basis of Design Product: Bradley 812-01-18.
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4 finish (satin).
   4. Outside Diameter: 1-1/2 inches.
   5. Configuration and Length: Straight, 18 inches long.
G. 36” Grab Bar:
   1. Basis of Design Product: Bradley 812-01-36.
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4 finish (satin).
   4. Outside Diameter: 1-1/2 inches.
   5. Configuration and Length: Straight, 36 inches long.
H. 42” Grab Bar:
   1. Basis of Design Product: Bradley 812-01-42.
   2. Mounting: Flanges with concealed fasteners.
   3. Material: Stainless steel, 0.05 inch thick.
      a. Finish: Smooth, No. 4 finish (satin).
   4. Outside Diameter: 1-1/2 inches.
   5. Configuration and Length: Straight, 42 inches long.
I. Sanitary Napkin Disposal Unit:
   1. Basis-of-Design Product: Bradley 4781-15.
   2. Mounting: Surface mounted.
   3. Door or Cover: Self-closing, disposal-opening cover.
   4. Receptacle: Removable.
   5. Material and Finish: Stainless steel, No. 4 finish (satin).
J. Mirror Unit:
   1. Basis of Design Product: Bradley 780 Series.
      a. Size: 24" by 36".
   2. Frame: Manufacturer’s standard.
      a. Corners: Manufacturer's standard.
   3. Hangers: Produce rigid, tamper and theft resistant installation, using method indicated below.
      a. One piece galvanized steel, wall hanger device with spring action locking mechanism to hold mirror unit in position with no exposed screws or bolts.

2.2 CUSTODIAL ACCESSORIES

A. Basis of Design Product: Subject to compliance with requirements, provide product by one of the following:
   1. Bobrick Washroom Equipment, Inc.
   2. Bradley Corporation. Basis of Design.
B. Utility Shelf:
   1. Basis of Design Product: Bradley 9934.
   2. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
   3. Size: 14 inches long by 8 inches deep.
   4. Hooks: Two.

5. Mop/Broom Holders: Four, spring loaded, rubber hat, cam type.
6. Material and Finish: Not less than nominal 0.05 inch thick stainless steel, No. 4 finish (satin).
    a. Shelf: Not less than nominal 0.05 inch thick stainless steel.
    b. Rod: Approximately ¼ inch diameter stainless steel.

C. Mop and Broom Holder:
1. Basis of Design Product: Bradley 9954.
2. Description: Unit with holders.
3. Length: 36 inches.
4. Mop/Broom Holders: Four, spring loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full length, continuous hinges. Equip units for concealed anchorage and with corrosion resistant backing plates.
B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
B. Remove temporary labels and protective coatings.
C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION

SECTION 10 44 16 - FIRE EXTINGUISHERS AND FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:
   1. Portable hand carried fire extinguishers.
   2. Fire protection cabinets.

1.3 SUBMITTALS

A. Per Division 01 section “Submittal Procedures”.
B. Product Data: For each type of product indicated.
   1. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and fire extinguisher cabinets.
   2. Fire Protection Cabinets: Include roughing in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
C. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
D. Operation and Maintenance Data: For fire extinguishers and fire extinguisher cabinets to include in maintenance manuals.
E. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
C. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire resistance rating of walls where they are installed.
D. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.
B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure of hydrostatic test according to NFPA 10.
   b. Faulty operation of valves or release levers.
2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HANDCARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet indicated.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Basis of Design: Larsen's Manufacturing Company.
         1) Class ABC- Model MP-10.
         2) For use in Kitchen: Class K- Model WC-6L.
      b. J. L. Industries, Inc.; a division of Activar Construction Products Group.
   2. Valves: Manufacturer's standard.
   3. Handles and Levers: Manufacturer's standard.
   4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Multipurpose Dry Chemical Typ: UL rated 4A-80B,C, 10 lb nominal capacity, with mono ammonium phosphate based dry chemical in manufacturer's standard enameled container.

2.2 MATERIALS

A. Cold Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 6 mm thick, with Finish 1 (smooth or polished).

2.3 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Basis of Design: Larsen's Manufacturing Company; Architectural Series Model 2409-RM Vertical Duo.
      b. J. L. Industries, Inc., a division of Activar Construction Products Group.

B. Cabinet Construction: Coordinate with rating of the wall that the cabinet is on.
   1. Fire Rated Cabinets:
      a. Provide fire rated cabinets where indicated on a fire rated wall.
      b. Construct fire rated cabinets with double walls fabricated from 0.0428 inch thick, cold rolled steel sheet lined with minimum 5/8 inch thick, fire barrier material. Provide factory drilled mounting holes.

C. Cabinet Material: Steel sheet.

D. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi recessed cabinet installation.
   1. Rolled-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.

E. Cabinet Trim Material: Same material and finish as door.

F. Door Material: Steel sheet.
G. Door Style: Vertical duo panel with frame.
H. Door Glazing: Acrylic sheet.
   1. Acrylic Sheet Color: Clear transparent acrylic sheet.
I. Door Hardware: Manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide manufacturer's standard.
   2. Provide manufacturer's standard hinge permitting door to open 180 degrees.
J. Accessories:
   1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked enamel finish.
   2. Break Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
   3. Door Handle: Manufacturer's standard.
   4. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
   5. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
      a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
         1) Location: Applied to cabinet door window.
         2) Application Process: Decals.
         3) Lettering Color: Red.
         4) Orientation: Vertical.
K. Finishes:
   1. Manufacturer's standard baked enamel paint for the following:
      a. Exterior of cabinet, door, and trim except for those surfaces indicated to receive another finish.
         1) Color: White

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
C. Finish fire protection cabinets after assembly.
D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL FINISHES

A. Factory Prime Finish: Apply manufacturer's standard, fast curing, lead and chromate free, universal primer immediately after surface preparation and pretreatment.
B. Baked Enamel or Powder Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two coat, baked on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils.
   1. Color and Gloss: As selected by Architect from manufacturer's standard range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi recessed cabinets will be installed.
B. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.
C. Proceed with installation only after unsatisfactory conditions have been corrected. Installation indicates acceptance of conditions.

3.2 PREPARATION

A. Prepare recesses for recessed and semi recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire extinguishers and fire extinguisher cabinets in locations indicated and in compliance with requirements of authorities having jurisdiction.
B. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
   1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.
C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
   1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire protection cabinets.
   2. Provide inside latch and lock for break glass panels.
   3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.
D. Identification: Apply decals at locations indicated.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures. As determined by Architect.

END OF SECTION

SECTION 13 34 19 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Extent of pre-engineered buildings work is shown on drawings.
B. Building Type: The pre-engineered building shown is a single story, single span, rigid frame type metal building of the nominal length, width, eave height and roof pitch indicated. Exterior walls are covered with metal wall panels. Endwalls are non expandable.
   1. Manufacturer's standard components may be used, providing components, accessories, and complete structure conform to architectural design appearance shown and to specified requirements.
C. Concrete floor and foundations and installation of anchor bolts are specified in Division 03.
D. Sealants and caulking are specified in a Division 07.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product information, specifications and installation instructions for building components and accessories.
B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:
   1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
   2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
      a. Show provisions for attaching mezzanines, roof curbs, service walkways, platforms, and pipe racks.
   3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
      a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
      b. Show wall-mounted items including personnel doors, vehicular doors, windows, louvers, and lighting fixtures.
      c. Show translucent panels.
   4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:
      a. Flashing and trim.
      b. Gutters.
      c. Downspouts.
      d. Service walkways.

C. Samples: Submit samples of the following items. Architect's review will be for color and texture only. Compliance with other requirements is the responsibility of the Contractor.
   1. 12" long by actual width of roofing and siding panels, with required finishes.
   2. Fasteners for application of roofing and siding panels.
   3. Sealants and closures.
   4. Translucent panels.

D. Delegated-Design Submittal: For metal building systems.
   1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer, licensed in the state of Oklahoma, responsible for their preparation.

E. Qualification Data: For erector.

F. Welding certificates.

G. Letter of Design Certification: Signed and sealed by a qualified professional engineer, licensed in the state of Oklahoma. Include the following:
   1. Name and location of Project.
   2. Order number.
   3. Name of manufacturer.
   4. Name of Contractor.
   5. Building dimensions including width, length, height, and roof slope.
   6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
   7. Governing building code and year of edition.
   8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
   9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
   10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

H. Erector Certificates: For qualified erector, from manufacturer.

I. Material Test Reports: For each of the following products:
   1. Structural steel including chemical and physical properties.
   2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shop primers.
   5. Nonshrink grout.

J. Source quality-control reports.

K. Field quality-control reports.

L. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.

M. Sample Warranties: For special warranties.

1.4 QUALITY ASSURANCE

A. Design Criteria:
   1. Structural Framing: Design primary and secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practices Manual".
   2. Structural Steel: For design of structural steel members, comply with requirements of the American Institute of Steel Construction's (AISC) "Specifications for the Design,

Fabrication, and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.

3. Light Gage Steel: For design of light gage steel members, comply with requirements of the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.
4. Welded connections: Comply with requirements of the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.

B. Design Loads: Basic design loads, as well as auxiliary and collateral loads, to meet the following design criteria: Deflection to be maximum of L/240; Drift to be maximum of H/400; base connection to be pin base, or as indicated on structural drawings.

1. Basic design loads include live load, wind load and seismic load, in addition to the dead load.
2. Auxiliary loads include dynamic live loads such as those generated by cranes and materials handling equipment.
3. Collateral loads include additional dead loads over and above the weight of the metal building system such as sprinkler systems and mechanical systems.
4. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design Practices Manual".

C. Manufacturer's Qualifications: A qualified manufacturer.

1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

D. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

F. Land Surveyor Qualifications: A professional land surveyor who practices in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store prefabricated components, sheets, panels, and other manufactured items so that they will not be damaged or deformed.

B. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight ventilated covering. Store metal sheets or panels so that water accumulations will drain freely. Do not store sheets or panels in contact with other materials which might cause staining.

1.6 MAINTENANCE:

A. Maintenance Stock: Furnish at least 5% excess over required amount of nuts, bolts, screws, washers, and other required fasteners for each building. Pack in cartons and store on site where directed.

1.7 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
   2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.
   1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide **Alliance Steel** product as noted or comparable product by one of the following:
   1. Alliance Steel, Inc.
   2. Armco Atlantic, Inc.
   3. Behlen Manufacturing Co.
   4. Ceco Buildings Division.
   5. Chief Industries, Inc.
   6. Dean Steel Buildings, Inc.
   7. Varco Pruden Buildings

2.2 MATERIALS:

A. Metals:
   1. W-Shapes: ASTM A992/A992M; ASTM A572/A572M, Grade 50 or 55; or ASTM A529/A529M, Grade 50 or 55.
   2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55; or ASTM A529/A529M, Grade 50 or 55.
   3. Plate and Bar: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55; or ASTM A529/A529M, Grade 50 or 55.
   4. Steel Pipe: ASTM A53/A53M, Type E or S, Grade B.
   5. Cold-Formed Hollow Structural Sections: ASTM A500, Grade B or C, structural tubing.
   6. Structural-Steel Sheet: Hot-rolled, ASTM A1011/A1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70; or cold-rolled, ASTM A1008/A1008M, Structural Steel (SS), Grades 25 through 80, or HSLAS, Grades 45 through 70.
   7. Metallic-Coated Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G60 coating designation; mill phosphatized.
   8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A755/A755M.

a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G90 coating designation.
b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, SS, Grade 50 or 80; with Class AZ50 coating.

9. Joist Girders: Manufactured according to "Standard Specifications for Joist Girders," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for primary framing.
10. Steel Joists: Manufactured according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for secondary framing.
11. Non-High-Strength Bolts, Nuts, and Washers: ASTM A307, Grade A, carbon-steel, hex-head bolts; ASTM A563 carbon-steel hex nuts; and ASTM F844 plain (flat) steel washers.
    a. Finish: Hot-dip zinc coating, ASTM F2329, Class C.
12. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
    a. Finish: Hot-dip zinc coating, ASTM F2329, Class C.
13. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts or Grade F2280 tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
14. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1 hardened carbon-steel washers.
    a. Finish: Plain.
15. Unheaded Anchor Rods: ASTM A572/A572M, Grade 50.
    a. Configuration: Straight.
    b. Nuts: ASTM A563 heavy-hex carbon steel.
    c. Plate Washers: ASTM A36/A36M carbon steel.
    d. Washers: ASTM F436 hardened carbon steel.
    e. Finish: Hot-dip zinc coating, ASTM F2329, Class C.
16. Headed Anchor Rods:ASTM F1554, Grade 36.
    a. Configuration: Straight.
    b. Nuts: ASTM A563 heavy-hex carbon steel.
    c. Plate Washers: ASTM A36/A36M carbon steel.
    d. Washers: ASTM F436 hardened carbon steel.
    e. Finish: Hot-dip zinc coating, ASTM F2329, Class C.
17. Threaded Rods: ASTM A572/A572M, Grade 50.
    a. Nuts: ASTM A563 heavy-hex carbon steel.
    b. Washers: ASTM F436 hardened carbon steel.

B. Finish: Hot-dip zinc coating, ASTM F2329, Class C.
C. Thermal Insulation: Provide vinyl backed glass fiber insulation, of not less than 0.5 lb. per cu.
D. ft. density, thickness to be 6" in exterior walls and 8" in roof, with UL flame spread classification of 25 or less, 2" wide continuous vapor tight edge tabs.
    1. Vapor Barrier: Reinforced Black Vinyl backed roll insulation in roof areas.

2. Retainer Straps: Provide 1 1/2" wide x 26-ga. formed galvanized steel retainer straps painted white to match the insulation facing. Install straps approximately 2' 6" o.c. in both directions to support roof insulation. Insulation to be laid between purlins resting on straps. All exposed edged to be sealed with matching tape.

E. Paint and Coating Materials: Unless otherwise indicated, paint and coating materials shall comply with performance requirements of the federal specifications indicated. Unless specifically indicated otherwise, compliance with compositional requirements of the federal specifications indicated is not required.

1. Primers:
   a. Shop Primer for Ferrous Metal: Provide fast-curing, lead-free, "universal" primer, as selected by the manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Comply with performance requirements of FS TT-P-645.
   b. Shop Primer for Ferrous Metal: Provide fast-curing, lead-free, abrasion-resistant, rust-inhibitive primer as selected by the manufacturer for compatibility with substrates, with types of alkyd finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Comply with performance requirements only of FS TT-P-86, Types I, II or III.
   c. Shop Primer for Galvanized Metal Surfaces: Provide zinc dust-zinc oxide primer as selected by the manufacturer for compatibility with substrate. Comply with performance requirements of FS TT-P-641.
   d. Shop Primer for Wood Surfaces: Provide alkyd primer as selected by the manufacturer for compatibility with the substrate. Comply with performance requirements of FS TT-P-25.
2. Finish Coats:
   a. Shop-Primed Metal Surfaces: Provide high gloss alkyd enamel finish coat as recommended by the manufacturer for use over primed ferrous metal surfaces. Comply with performance requirements of FS TT-E-489.
   b. Shop-Primed Metal Surfaces: Provide semi-gloss alkyd enamel finish coat as recommended by the manufacturer for use over primed ferrous metal surfaces. Comply with performance requirements of FS TT-E-529, Class A.
   c. Shop-Primed Metal Surfaces: Provide flat, lusterless alkyd enamel finish coat as recommended by the manufacturer for use over primed ferrous metal surfaces. Comply with performance requirements of FS TT-E-527.
   d. Shop-Primed Metal Surfaces: Provide semi-gloss silicone alkyd enamel finish coat as recommended by the manufacturer for use over primed ferrous metal surfaces. Comply with performance requirements of FS TT-E-490.
   e. Shop-Primed Wood Panels: Provide high-gloss alkyd enamel finish coat as recommended by the manufacturer for use over primed ferrous metal surfaces. Comply with performance requirements of FS TT-E-489.

2.3 STRUCTURAL FRAMING:

A. Rigid Frames shall be fabricated from hot-rolled structural steel. Provide built-up "I-beams" shape or open web type rigid frames consisting of either tapered or parallel flange beams and tapered columns without interior columns. Provide frames factory welded and shop painted. Furnish frames complete with attachment plates, bearing plates, and splice members. Factory drill frames for bolted field assembly.

1. Provide length of span and spacing of frames indicated. Slight variations in length of span and frame spacing may be acceptable if necessary to meet manufacturer's standard.

2. Provide rigid frame at endwalls where indicated.
3. Frame drift limits shall not exceed: H/400.
4. Rigid frame column depth limited to 24” until 10’-0” above finish floor.

B. End Wall Columns: Provide factory welded, shop painted endwall columns of not less than 14-ga. built-up "I" shape or cold-formed sections. End wall columns to fit within exterior wall and not interfere with kitchen equipment.

C. Lateral Bracing: Provide portal frames or wind bent frames as required.

D. Secondary Framing:
1. Provide not less than 16-ga. shop painted rolled formed sections for the following secondary framing members:
   a. Purlins.
   b. Eave struts.
   c. Endwall beams.
   d. Flange bracing.
   e. Sag bracing.
2. Provide not less than 14-ga. cold-formed galvanized steel sections for the following secondary framing members:
   a. Base channels.
   b. Sill angles.
   c. Endwall structural members (except columns and beams).
   d. Purlin spacers.

E. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.
1. Type: As indicated on Drawings.

F. Bolts: Provide shop painted bolts, except when structural framing components are in direct contact with roofing and siding panels. Provide zinc-plated or cadmium-plated bolts when structural framing components are in direct contact with roofing and siding panels.

G. Shop Painting: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power tool cleaning, SSPCSP7 for brush-off blast cleaning, and SSPC-SP1 for solvent cleaning.
1. Prime structural steel primary and secondary framing members with the manufacturer's standard rust-inhibitive primer.
2. Prime galvanized members, after phosphoric acid pretreatment with manufacturer's standard zinc dust-zinc oxide primer.

2.4 WALL, ROOFING, SIDING, AND SOFFIT PANELS:

A. Panels: Metal building manufacturer is required to be a member of Metal Building Manufacturers’ Association. Fabricator is required to have appropriate AISC Certification.
1. Roof Panels: Basis of Design: Alliance Steel “Alliance Lok 16 - Alok 16 Panel” Kynar color coated.
   a. Material: Steel sheet, zinc coated by the hot-dip process, complying with ASTM A 653/A 653M, G90, structural quality, and prepainted by the coil-coating process to comply with ASTM A 755/A 755M; manufacturer's standard standing seam panel; 24 gauge.
   b. Color:
      1) Roof Panels: Match existing adjacent building.
2. Wall Panels:
   a. Wall Panels: Basis of Design: Alliance Steel “R- Panel” 36 inch, 26 gauge.

1) Color: Match existing adjacent building.

3. Fascia Panels: Basis of Design: Alliance Steel "R- Panel" 36 inch, 24 gauge, Kynar color coated.
   a. Fascia Color: Match existing adjacent building
   b. Vertical Mansard Panel (Inside the mechanical equipment): Galvalume
4. Soffit Panels: Basis of Design Alliance Steel "A12 Soffit Panel" 12 inch, 24 gauge, Kynar color coated.
   a. Texture: Striated or ribbed.
   b. Venting: As indicated on Drawings or as Required.
   c. Color: Match existing adjacent building.
5. Metal Panel Finish: Fluoropolymer 2-coat system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a total minimum dry film thickness of 1 mil.

B. Flashing and Trim: Form from 26 gauge, zinc-coated (galvanized) steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Finish flashing and trim same as adjacent roof or wall panels.

C. Gutters and Downspouts: Form zinc-coated (galvanized) steel sheet prepainted with coil coating. Match gutters to profile of gable trim and finish gutters to match roof fascia and rake trim. Finish downspouts to match wall panels.

D. Reinforced Vinyl-Faced Glass-Fiber-Blanket Insulation at Roof: Thermal insulation, complying with ASTM C 991, Type II, 0.5-lb/cu. ft. density, with a flame-spread index of 25 or less, and 2-inch- wide, continuous, vapor-tight edge tabs; R-30; black vinyl backed fiberglass insulation.

E. Wall Insulation: R-19. Refer to Division 07.

F. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.

G. Hardware: Refer to Division 08.

H. Miscellaneous Materials:
   1. Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer; complying with performance requirements of FS TT-P-664.
   2. Primer for Galvanized Metal Surfaces: Zinc dust, zinc-oxide primer; FS TT-P-641.
   3. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
   4. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant as recommended by metal building system manufacturer.

I. Accessories: Provide the following sheet metal accessories factory formed of the same material and finish as the roofing and siding.
   1. Flashings.
   2. Closers.
   3. Fillers.
   4. Metal expansion joints.
   5. Ridge covers.
   6. Fascias.

J. Flexible Closure Strips: Provide closed-cell, expanded cellular rubber, self-extinguishing flexible closure strips. Cut or premold closure strips to match corrugation configuration of roofing and siding sheets. Provide closure strips where indicated or necessary to ensure weathertight construction.

K. Sealing Tape: Provide pressure sensitive 100 percent solids grey polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, non toxic, non staining tape not less than 1/2" wide and 1/8" thick.

L. Joint Sealant: Provide one-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as recommended by the building manufacturer.

2.5 SHEET METAL ACCESSORIES:

A. General: Provide coated steel sheet metal accessories with coated steel roofing and siding panels.
B. Gutters: Form gutters in sections not less than 8 feet in length, complete with end pieces, outlet tubes and other special pieces as may be required. Join sections with riveted and soldered or sealed joints. Provide expansion-type slip joint at center of runs. Furnish gutter supports space at 36" o.c., constructed of same metal as gutters. Provide bronze, copper, or aluminum wire ball strainers at each outlet. Finish to match roof fascia and rake.
C. Downspouts: Form downspouts in sections approximately 10 feet long, complete with elbows and offsets. Join sections with not less than 1-1/2" telescoping joints. Provide fasteners, designed to securely hold downspouts not less than 1" away from walls; locate fasteners at top and bottom and at approximately 5 feet on center in between. Finish to match wall panels.

2.6 FABRICATION:

A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged and reassembled with a minimum amount of labor.
   1. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams and instruction manuals.
B. Structural Framing: Shop fabricate structural framing components to the indicated size and section complete with base plates, bearing plates and other plates required for erection, welded in place. Provide required holes for anchoring or connections either shop drilled or punched to template dimensions.
   1. Shop Connections: Provide power riveted, bolted or welded shop connections.
   2. Field Connections: Provide bolted field connections.

PART 3 - EXECUTION

3.1 ERECTION:

A. Framing: Erect structural framing true to line, level and plumb, rigid and secure. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a non-shrinking grout to obtain uniform bearing and to maintain a level base line elevation. Moist cure grout for not less than 7 days after placement.
B. Purlins and Girts: Provide rake or gable purlins with tight fitting closure channels and fascias. Locate and space wall girts to suit door and window arrangements and heights. Secure purlins and girts to structural framing and hold rigidly to a straight line by sag rods.
C. Bracing: Provide diagonal rod or angle bracing in both roof and sidewalls as indicated.
   1. Movement resisting frames may be used in lieu of sidewall rod bracing, to suit manufacturer's standards.
   2. Where diaphragm strength of roof or wall covering is adequate to resist wind forces, rod or other forms of bracing will not be required.
D. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.

3.2 FIELD PAINTING:

A. General: Apply finish coating to the following factory-primed items:
   1. Structural framing components where exposed.
   2. Hollow metal doors and frames.
   3. Finish colors shall be as indicated or, if not indicated, as selected by Architect from manufacturer's standards.

B. Cleaning and Touch-Up: Prior to application of finish coats, clean component surfaces of matter that could preclude paint bond.
   1. Touch up abrasions, marks, skips or other defects to shop-primed surfaces with same type material as shop primer.

C. Protection: Protect work of other trades. Correct painting related damages by cleaning, repairing or replacing, and refinishing, as directed by the Architect.

D. Coordination: Provide finish coats that are compatible with prime paints used. Provide barrier coats over incompatible primers where required. Notify the Architect in writing of problems anticipated using the specified coatings with substrates primed by others.

E. Surface Preparation: Perform preparation and cleaning procedures in strict accordance with coating manufacturer's instructions for each substrate condition.
   1. Remove hardware and accessories and similar items in place and not to be finish-painted, or provide surface-applied protection. Reinstall removed items.

F. Material Preparation: Mix, prepare, and store painting and finishing materials in accordance with manufacturer's directions.

G. Application: Apply painting and finishing materials in accordance with manufacturer's directions. Use applicators and techniques best suited for material and surfaces to which applied.
   1. Apply additional coats when undercoats or other conditions show through final coat, until paint film is of uniform finish, color and appearance.
   2. Finish exterior hollow metal doors on tops, bottoms and edges same as exterior faces.
   3. Sand lightly between succeeding enamel or varnish coats. Thickness of not less than 2.5 mils for the entire coating system of prime and finish coats.
   4. Shop-Primed Wood Panels: 2 coats acrylic emulsion (FS TT-P-19).
   5. Shop-Primed Metal Surfaces: 2 coats high gloss alkyd enamel (FS TT-E-489).
   6. Shop-Primed Metal Surfaces: 2 coats semi-gloss alkyd enamel (FS TT-E-529).
   7. Shop-Primed Metal Surfaces: 2 coats lusterless alkyd enamel (FS TT-E-527).
   8. Shop-Primed Metal Surfaces: 2 coats semi-gloss silicone alkyd enamel (FS TT-E-490).

H. Dissimilar Materials: Where aluminum surfaces come in contact with ferrous metal or other incompatible materials, keep aluminum surfaces from direct contact by applications to the other material as follows:
   1. One coat of zinc chromate primer, FS TT-P-645, followed by two coats of aluminum paint, SSPC-Paint 101.
   2. In lieu of 2 coats of aluminum paint, apply one coat of high- build bituminous paint, SSPC-Paint 12, applied to a thickness of 1/16" over zinc chromate primer.
   3. Backpaint aluminum surface where it is impractical to paint the other surface.

END OF SECTION

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

The Engineer retains ownership of all copies of drawings and specifications. These documents shall not be used for work other than for the specific project identified by the Engineer's project number.

The Engineer. shall return all copies of drawings and specifications to the Engineer at completion of the project or upon the Engineer's request.

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Plumbing demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. CPVC: Chlorinated polyvinyl chloride plastic.
3. PE: Polyethylene plastic.
4. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
c. Ring-Type: For raised-face flanges.

2. AWWA C110, rubber, flat face, 1/8-inch-thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
3. PVC to ABS Piping Transition: ASTM D 3138.

2.4 TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Available Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Dresser Industries, Inc.; DMD Div.
c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
d. JCM Industries.
e. Smith-Blair, Inc.
f. Viking Johnson.

2. Underground Piping NPS 1-1/2 and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 and Larger: AWWA C219, metal sleeve-type coupling.
4. Aboveground Pressure Piping: Pipe fitting.

B. Plastic-to-Metal Transition Fittings: CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Available Manufacturers:

a. Eslon Thermoplastics.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Available Manufacturers:

a. Thompson Plastics, Inc.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC or PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Available Manufacturers:

a. NIBCO INC.
b. NIBCO, Inc.; Chemtrol Div.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

1. Available Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Fernco, Inc.
c. Mission Rubber Company.
d. Plastic Oddities, Inc.

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.

f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150-psig minimum working pressure as required to suit system pressures.

1. Available Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Available Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Calpico, Inc.
b. Lochinvar Corp.

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

1. Available Manufacturers:

a. Perfection Corp.
b. Precision Plumbing Products, Inc.
c. Sioux Chief Manufacturing Co., Inc.
d. Victaulic Co. of America.
e. Allpass Corporation

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
   1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.8 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome plated.

E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.9 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PLUMBING DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved by Engineer.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors where piping is exposed to view and at all plumbing fixtures according to the following:

1. New and Existing Piping:

    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: Split-casting or one-piece, cast-brass type with polished chrome-plated finish and set screw.
    c. Insulated Piping at Wall and Ceiling Penetrations where exposed to view: One-piece or split-plate, stamped-steel type with spring clips or set screw.
    d. Bare Piping at Wall and Ceiling Penetrations where exposed to view: One-piece or split-plate, stamped-steel type with spring clips or set screw.
    e. Insulated or Bare Piping at Floor Penetrations where exposed to view: One-piece or Split-Casting, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

    a. PVC or Steel Pipe Sleeves: For pipes smaller than NPS 6.
    b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
    c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

        1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 07 Section "Penetration Firestopping" for materials.

T. Verify final equipment locations for roughing-in.

U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to ASME Section IX – B31.9 Building Services using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.
5. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel, and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi 28-day compressive-strength concrete and reinforcement or as otherwise specified in Division 03 Section "Cast-in-Place Concrete or Miscellaneous Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.10 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Brass or bronze ball valves.
2. Iron, single-flange butterfly valves.
3. Grooved-end butterfly valves.
4. Bronze or brass swing check valves.
5. Wafer double disc check valves.

B. Related Sections:
1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set ball valves open to minimize exposure of functional surfaces.
4. Set butterfly valves closed or slightly open.
5. Block check valves in either closed or open position.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.
2. Handlever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Butterfly Valves: With extended neck.

F. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.

2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS OR BRONZE (LEAD-FREE) BALL VALVES

A. Two-Piece, Full-Port, Brass or Bronze Ball Valves with Brass or Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crane Fluid Systems
    b. Hammond Valve
    c. Jomar Valve
    d. Apollo Valves.
    e. Nibco Inc.
    f. Milwaukee Valve Company.
    g. Red-White Valve Corporation.
    h. Watts

2. Description:
    a. Standard: MSS SP-110.
    b. SWP Rating: 150 psig.
    c. CWP Rating: 600 psi.
    d. Body Design: Two piece.
    e. Body Material: DZR Lead-free brass or bronze.
    f. Ends: Threaded or sweat.
    g. Seats: PTFE or RPTFE
    h. Stem: Lead-free brass
    i. Ball: Chrome-plated, lead-free brass or stainless steel
    j. Port: Full.

2.3 IRON, SINGLE-FLANGE (LEAD-FREE) BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze or Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Stockham
    b. Crane Fluid Systems
    c. Hammond Valve
    d. Jomar Valve
    e. Apollo Valves.
    f. Nibco Inc.

g. Milwaukee Valve Company.
h. Red-White Valve Corporation.
i. Watts

2. Description:
   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 200 psig.
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 536, ductile iron.
   e. Seat: EPDM.
   f. Stem: One -piece stainless steel.
   g. Disc: Aluminum bronze or stainless steel.

2.4 GROOVED-END (LEAD-FREE) BUTTERFLY VALVES

A. Iron Grooved-End Butterfly Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Victaulic Company.
      b. Nibco.
      c. Anvil.
      d. Apollo.

   2. Description:
      a. Standard: MSS SP-67, Type I.
      b. Maximum Pressure Rating: 200 psig.
      c. Body Material: Coated, ductile iron.
      d. Stem: Two-piece stainless steel.
      e. Disc: Coated, ductile iron.
      f. Seal: EPDM.

B. Bronze Grooved-End Butterfly Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Victaulic Company.
      b. Nibco.
      c. Anvil.
      d. Apollo.

   2. Description:
      a. Standard: MSS SP-67, Type I.
      b. Maximum Pressure Rating: 300 psig.
      c. Body Material: ASTM B584 Bronze, Low Lead
      d. Stem: Two-piece stainless steel.
      e. Disc: Coated, ductile iron.
      f. Seal: EPDM.

2.5 BRONZE OR BRASS SWING CHECK VALVES

A. Class 125, Bronze or Brass Swing Check Valves with Bronze or Brass Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Crane Fluid Systems
    b. Hammond Valve
    c. Jomar Valve
    d. Apollo Valve
    e. Nibco Inc.
    f. Milwaukee Valve Company.
    g. Red-White Valve Company.

2. Description:
    a. Standard: MSS SP-80, SP-139.
    b. CWP Rating: 200 psig.
    c. Body Design: Horizontal flow.
    d. Body Material: DZR Lead-free brass or bronze.
    e. Ends: Threaded or sweat.
    f. Disc: DZR bronze or brass.

2.6 WAFER DOUBLE DISC CHECK VALVES

A. Class 125, Wafer-Style, Lead-Free Iron Body Double Disc Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Stockham.
    b. Apollo Valve
    c. Keckley Valve
    d. Nibco Inc.
    e. Keckley Company.

2. Description:
    a. Standard: MSS SP-6, SP-25, SP-55.
    b. CWP Rating: 200 psig.
    c. Body Design: Horizontal or vertical flow.
    d. Body Material: ASTM A126 Class B Cast Iron.
    e. Pin: Stainless Steel
    f. Disc: Aluminum Bronze or Stainless Steel.
    g. Seat: EPDM.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, used to prevent movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves in accessible locations for easy access/service. Provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Wafter Double Disc Check Valves: In horizontal or vertical position, between flanges.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
1. Shutoff Service: Ball or butterfly valves.
2. Check Valves:
    a. NPS 2 and Smaller: Bronze or brass swing check valves with bronze or brass disc.
    b. NPS 2-1/2 and Larger for Domestic Water: Wafer double disc check valves with aluminum bronze or stainless-steel disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Grooved-End Copper Tubing: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
   1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Ball Valves: Two-piece, full port, brass, or bronze with brass or bronze trim (chrome plated where required).
   3. Bronze or Brass Swing Check Valves: Class 125, bronze or brass disc.

B. Pipe NPS 2-1/2 and Larger:
   1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Ball Valves to NPS 4: Two-piece, full port, brass, or bronze with brass or bronze trim (chrome plated where required).
   3. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
   4. Iron, Single-Flange (Lead-free) Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze or stainless-steel disc.
   5. Iron, Grooved-End Butterfly Valves: 200 psig maximum working pressure.
   6. Bronze, Grooved-End Butterfly Valves: 300 psig maximum working pressure.
   7. Water, Double-disc Check Valves: 200 psig CWP, EPDM seats.

END OF SECTION

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener Systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Fastener Systems.
4. Pipe positioning systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.4, "Structural Welding Code--Reinforcing Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Empire Industries, Inc.
3. ERICO/Michigan Hanger Co.
4. Grinnell Corp.

5. Anvil

C. Galvanized, Metallic Coatings: Pre-galvanized, hot dipped, or electro-galvanized.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Thomas & Betts Corporation.
4. Unistrut Corp.; Tyco International, Ltd.
5. Anvil

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. ERICO/Michigan Hanger Co.
2. PHS Industries, Inc.
3. Pipe Shields, Inc.
4. Rilco Manufacturing Company, Inc.
5. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated or stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2.7 PIPE STANDS

A. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

1. Manufacturers:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.
c. Anvil

B. Low-Type, Single-Pipe Stand: One-piece plastic or stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

1. Manufacturers:

a. MIRO Industries.
b. Anvil

C. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Manufacturers:

   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.
   c. Portable Pipe Hangers.
   d. Anvil

2. Base: Plastic or Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

D. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Manufacturers:

   a. Portable Pipe Hangers.

2. Bases: One or more plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

E. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.8 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers:

1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.
4. Sioux Chief

2.9 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.10 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Uninsulated pipes 2 inch and smaller:
   a. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes.
   b. Adjustable steel swivel J-hanger (MSS Type 5): For suspension of pipes, and to allow off-center closure for hanger installation before pipe erection.
   c. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes.
   d. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated stationary pipes.
2. Uninsulated pipes 2 ½" and larger:
   a. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated stationary pipes.
   b. Single Pipe Rolls (MSS Type 41): For suspension of pipes from 2 rods if longitudinal movement caused by expansion and contraction might occur.
   c. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes from single rod if horizontal movement caused by expansion and contraction might occur.
3. Insulated pipe – Hot or steam piping:
   a. 2 inch and smaller: Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of insulated stationary pipes with insulation protection shield or insert.
   b. 2 1/2 inch and larger:

1) Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, from single rod if horizontal movement caused by expansion and contraction might occur. Provide pipe covering protection shield/saddle or insert.
2) Single Pipe Rolls (MSS Type 41): For suspension of pipes from 2 rods if longitudinal movement caused by expansion and contraction might occur. Provide pipe covering protection shield/saddle or insert.

4. Insulated pipe – Cold or chilled water piping:
   a. 5 inch and smaller: Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of insulated stationary pipes with insulation protection shield or insert.
   b. 6 inch and larger:
      1) Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, from single rod if horizontal movement caused by expansion and contraction might occur with insert
      2) Single Pipe Rolls (MSS Type 41): For suspension of pipes from 2 rods if longitudinal movement caused by expansion and contraction might occur with insert.

F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

H. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

J. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary, to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.

b. Vertical (MSS Type 55): Mounted vertically.
c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

N. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

G. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 22 Section "Plumbing Fixtures" for plumbing fixtures.

H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

O. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 [painting Sections.] [Section "High-Performance Coatings."]

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16-inch min. thickness, and having predrilled holes for attachment hardware.
   2. Letter Color: Black.
   3. Background Color: White.
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   7. Fasteners: Stainless-steel rivets or self-tapping screws.
   8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

   1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
   2. Lettering Size: At least 1-1/2 inches high.

E. Underground Pipe Marker Tape: Bright colored plastic ribbon tape, minimum 6 inches wide by 4 mil thick, continuously imprinted to indicate piping service, manufactured for direct burial service.

F. Underground Metallic Detection Tape: Bright colored plastic ribbon tape, minimum 6-inches wide by 4 mil thick, metallic film bonded to tape, continuously imprinted to indicate piping service, manufactured for direct burial service.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass or stainless steel and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment, including but not limited to the following:

1. Water Heaters
2. Temperature Mixing Valves
3. Recirculation Pumps

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping, if required, is specified in Division 09.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 20 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:
   1. Conform to ASME A13.1.

D. Install underground pipe marking tape 8 to 12 inches below finished grade, directly above buried pipe.
   1. Use plastic pipe marker tape for all metallic piping below grade.
   2. Use metallic detection tape for all non-metallic piping below grade.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

END OF SECTION

SECTION 220700 – PLUMBING / PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Work Included:

1. Piping Insulation Including Valves and Fittings

1.3 SUBMITTALS

A. Product Data: Submit product data for the following as specified under Section 15010.

1. All Insulation

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Insulation (Fiberglass)

1. Knauf
2. Owens-Corning Fiberglass
3. Johns-Manville
4. CertainTeed

2.2 PIPE INSULATION

A. Piping: Insulate with Fiberglas SSL-11 ASJ pipe insulation with self-sealing lap. ASTM C547 Type I, Maximum K/inch = .29 at 200 deg. F. Piping insulation shall conform to the minimum insulation requirements as listed in Table A. Apply insulation with all sides and end joints butted tightly. Seal ends of insulation with vapor barrier mastic at each fitting and at each joint.

Adhere ASJ jacket by removing release paper after the insulation is installed on pipe and sealing the lap starting in the center of each section working towards the ends. Adhesive must be pressured by rubbing with nylon sealing tool or other hard edge. Apply pressure sensitive adhesive coated butt strips in the same manner. NOTE: Minimum ambient temperature for this adhesive is 25 dg. F.

All insulation shall be continuous through wall and ceiling openings and sleeves. Insulation on all cold surfaces where vapor barrier jackets are used will be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., which are secured directly to cold surfaces must be adequately insulated and vapor-sealed to prevent condensation. **Crushing of insulation at hangers is not permitted and will require pipe saddles with high-density foam glass inserts.** Pipe saddles shall be insulated as required to complete a continuous unbroken insulation of pipe as specified for the piping being supported. Specified adhesives mastics and coatings shall be applied at the manufacturer's recommended minimum coverage per gallon.

B. Fittings: All fittings, valves, flanges, shall be covered with PVC pre-molded one-piece fitting covers utilizing factory supplied hi-lo temperature insulation insert. Insulation insert shall be applied to the fitting with ends of insert tucked snugly into throat of fitting and edges adjacent to pipe. No gaps shall occur between fitting insulation and pipe insulation. Secure PVC pre-molded cover to insulated fitting by stapling and taping edges of cover with Zeston color matching Z-tap. Chilled and cold-water systems, fittings, valves, flanges, PVC pre-molded fitting cover shall be secured with Zeston Vapor Barrier Adhesive or Equal (Fosters 85-20). Circumferential edges of cover shall be wrapped with Zeston color matching Z-tape. The tape shall extend over adjacent pipe insulation and overlap itself at least 2" on the downward side.

C. Exposed pipe insulation shall be protected and receive an exterior heavy duty jacketing equal to CEEL-CO 300 series PVC jacketing.

TABLE A [a, b, c, d, e]
Minimum Pipe Insulation Thickness(in.)

Fluid Design Operating Temperature Range (^oF)	Insulation Conductivity		Nominal Pipe Diameter (in.)				
	Conductivity Range BTU – in./ (h - ft^2 - ^oF)	Mean Rating Temperature ^oF	Less than 1	1 to less than 1 ½	1 ½ to less than 4	4 to less than 8	8 & Up
Heating Systems (Steam, Steam Condensate, and Hot Water)							
Above 350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.22-0.28	100	1.0	1.0	1.5	1.5	1.5
Domestic and Service Hot Water, Condensing Water Systems							
105 and Greater	0.22-0.28	100	1.0	1.0	1.5	1.5	1.5
Cooling Systems (Domestic Cold Water, Condensate Drains, Roof and Overflow Drains, Chilled Water, Brine, and Refrigerant)							
40-60	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
Below 40	0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

[a] These thicknesses are based on energy efficiency considerations only. Additional insulation and vapor retarders are sometimes required relative to safety issues/surface temperature, and issues such as water vapor permeability or surface condensation.

[b] For Heating Systems and Domestic and Service Hot Water systems piping smaller than 1.5 in. and located in partitions within conditioned spaces, reduction of these thickness by 1 in. shall be permitted but not to thicknesses below 1 in.

[c] For direct-buried Heating and Domestic and Service Hot Water systems piping, reduction of these thicknesses by 1.5 in. shall be permitted but not to thickness below 1 in. For direct-buried cooling system piping, insulation is not required.

[d] The table is based on steel pipe. Nonmetallic pipes schedule 80 thickness or less shall use the table values. For other nonmetallic pipes having thermal resistance greater than that of steel pipe, reduced insulation thicknesses are permitted if documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per foot/meter than a steel pipe of the same size with the insulation thickness shown in table.

[e] All above ground traps and waste piping that receives cooling coil condensate shall be insulated with minimum 0.5 in. thick pipe insulation.

PART 3 - EXECUTION

3.1 PREPARATION

A. All testing of piping shall be completed, and all leaks repaired prior to application of insulation.

3.2 INSTALLATION

A. All insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire and smoke hazard ratings as tested by procedure ASTM E-84, NFPA 255 and Underwriters' Laboratories, Inc. Standard #723, not to exceed:

Flame Spread	25
Smoke Developed	50
Fuel Contributed	50

Accessories, such as adhesives, mastics, cements, tapes, and glass cloth for fitting shall have the same component ratings as listed above. All products or their shipping cartons shall bear a label indicating flame and smoke ratings in compliance with the listed ratings maximum. Any treatment of jackets or facings to impart flame and smoke-safety shall be permanent. The use of water-soluble treatments is prohibited. The Insulation Contractor shall certify, in writing, prior to installation, that all products to be used will meet the above criteria.

B. Edges of insulation and butt joints shall be taped with joint sealing tape. The vapor barrier for cold or dual temperature equipment and piping shall be secure at all times; no staples shall be used to close or secure jacket in these systems.

C. Adhesives, Sealers, Facings, and Vapor Barrier Coatings shall be compatible with materials to which applied, and shall not corrode, soften, or otherwise attack the pipe or insulation materials in either the wet or dry state. Use only adhesives, sealers, facings, and vapor barrier coatings recommended by the approval manufacturer of insulation materials.

D. Install materials in accordance with manufacturer’s instructions.

E. On exposed piping, locate insulation and cover seams in least visible locations.

F. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:
   1. Provide vapor barrier, factory applied, or field applied.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
   3. Provide finish coating of type specified for insulation used.
   4. PVC fitting covers shall be used with all service insulation jacket.
   5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
   6. Insulate entire system including fittings, valves, unions, flanges, trainers, flexible connections, and expansion joints.
   7. Insulate and vapor seal hangers, supports, anchors, and other equipment attached directly to cold surfaces to prevent condensation.

G. For insulated pipes conveying fluids above ambient temperature:

   1. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
   2. Provide finish coating of type specified for insulation used. PVC fitting covers shall be used with all service insulation jacket.
   3. PVC fitting covers shall be used with all service insulation jacket. Insulate entire system including fittings, valves, unions, flanges, trainers, flexible connections, and expansion joints.
   4. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
   5. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment

H. Inserts and Shields:

   1. Application: Piping 1-inch diameter or larger.
   2. Shields: Factory coated galvanized steel or aluminum between pipe hangers or pipe hanger rolls and inserts, ribbed with rolled edges for use with pipe hangers.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: same thickness and contour as adjoining insulation length:

Nom. Pipe Size (inch)	Insert Length (inch)
½ to 2½	6
3 to 6	9
8 to 10	12
12 and over	18

   5. Insert Material: ASTM C640 cork, hydrous calcium silicate insulation, or other heavy density insulating material suitable for the planned temperature range.

I. Finish insulation at supports, protrusions, and interruptions.

J. Install insulation for equipment requiring access for maintenance, repair, or cleaning, in such a manner that it can be easily removed and replaced without damage.

END OF SECTION

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Flexible connectors.
3. Escutcheons.
4. Sleeves and sleeve seals.

1.3 SUBMITTALS

A. Product Data: For the following products:

1. Transition fittings.
2. Dielectric fittings.
3. Flexible connectors.
4. Escutcheons.
5. Sleeves and sleeve seals.

B. Water Samples: Specified in "Cleaning" Article.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components.

C. Comply with NSF 61 for potable domestic water piping and components.

1.5 ACCEPTABLE MANUFACTURERS:

A. All pipe, fittings, and valves shall be American made.

B. Copper Piping:

Pipe	Fittings
1. Mueller	1. Mueller
2. Halstead	2. Elkhart
3. Reading	3. Nibco
4. Cerro	4. Cerro
5. Great Lakes	

C. Press Fittings: Veiga, Apolloxpress, Nibco or engineer pre-approved equal.

D. Plastic Piping:

Pipe	Fittings
1. Charlotte	1. Charlotte
2. Nibco	2. Nibco
3. Jetstream	3. RG Sloane
4. Uponor (PEX)	4. Uponor (PEX)

1.6 PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Architect or Construction Manager \ General Contractor **and** Owner no fewer than seven (7) days in advance of proposed interruption of water service.
2. Do not proceed with interruption of water service without owner's written permission.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS:

A. Water Piping, Buried Within 5 Feet of Building:

1. Copper Tubing: ASTM B88, Type K, annealed.

   a. Fittings: ASME B16.22 wrought copper.
   b. Joints: AWS A5.8, BCuP-5. Lead free brazed joints with 15% silver composition equal to Sil-Fos.

2. PVC Pipe: ASTM D1785, Schedule 80.

   a. Fittings: ASTM D2467, PVC, Schedule 80 socket type.
   b. Joints: ASTM D2672, ASTM D2855, solvent weld with ASTM D2564 Solvent cement.

3. Crosslinked Polyethylene PEX a Pipe: PEX-a (Engel-Method Crosslinked Polyethylene), ASTM F876 and F877 (CAN/CSA-B137.5), SDR 9, CTS, 1/2-inch (16mm) through 3-inch (75mm) nominal pipe size.

    a. PEX-a piping shall be tested to comply with the ASTM F2023 requirement for minimum chlorine resistance at the end use condition of 100% of the time at 140°F (60°C) at 80 psi (0.55 MPa) gauge pressure.
        1) PEX-a piping and tubing Material Designation Codes shall be PEX5106 or PEX5306.
    b. Fittings:
        1) Third-party certified to NSF 14 and ASTM F1960 cold-expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3-inch nominal pipe size fittings manufactured from the same source as PEX-a piping manufacturer and marked "F1960".

B. Water Piping, Above Grade:

1. Copper Tubing: ASTM B88, Type L, hard drawn.

    a. Fittings: ASME B16.18 cast bronze, ASME B16.22 wrought copper, or ASME B16.24 150 psi flanged.
    b. Joints up to 2": ASTM B32, lead free nickel-bearing solder equal to Harris Bridgit BRGT61. Compatible water-soluble non-toxic flux classified for potable water systems.
    c. Joints 2 1/2 Inch and larger: AWS A5.8, BCuP-5. Lead free brazed joints with 15% silver composition equal to Sil-Fos
    d. Unions: 150 psi copper, solder type socket ends.

2. Crosslinked Polyethylene PEX a Pipe: PEX-a (Engel-Method Crosslinked Polyethylene), ASTM F876 and F877 (CAN/CSA-B137.5), SDR 9, CTS, 1/2-inch (16mm) through 3-inch (75mm) nominal pipe size.

    a. PEX-a piping shall be tested to comply with the ASTM F2023 requirement for minimum chlorine resistance at the end use condition of 100% of the time at 140°F (60°C) at 80 psi (0.55 MPa) gauge pressure.
        1) PEX-a piping and tubing Material Designation Codes shall be PEX5106 or PEX5306.
    b. Fittings:
        1) Third-party certified to NSF 14 and ASTM F1960 cold-expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3-inch nominal pipe size fittings manufactured from the same source as PEX-a piping manufacturer and marked "F1960".

C. Press Fittings (Viega Copper Press or equal by manufacturers listed):
Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press end shall have SC (Smart Connect) feature design (leakage path). Smart Connect ™ (SC Feature) in ProPress ½" to 4" dimensions. The Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. The function of

this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.2 PIPING JOINING MATERIALS

A. Unions & Couplings

1. 2" and smaller:

a. For copper piping: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2. 2 1/2" and larger:

a. For copper piping: bronze flanges, ASME B16.24, Class 150.

B. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8-inch-thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

C. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

2.3 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Dresser Piping Specialties.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc; a Sensus company.
g. Viking Johnson; c/o Mueller Co.

D. Plastic-to-Metal Transition Fittings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Charlotte Pipe and Foundry Company.
    b. Harvel Plastics, Inc.
    c. Spears Manufacturing Company.

2. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket end.

E. Plastic-to-Metal Transition Unions:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Colonial Engineering, Inc.
    b. NIBCO INC.
    c. Spears Manufacturing Company.

2. Description: PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint plastic end, rubber O-ring, and union nut.

F. PEX-to-Metal Transition Fittings:

1. Manufacturers: Provide fittings from the same manufacturer of the piping.
2. Third-party certified to NSF 14 and ASTM F1960 cold expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3-inch nominal pipe size fittings manufactured from the following material types:

    a. PEX-a to Thread Transition: One-piece Lead free (LF) brass fitting with male or female threaded adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
    b. PEX-a to Copper Sweat Transition: One-piece lead free (LF) brass fitting with sweat adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
    c. PEX-a to Copper Press Transition: One-piece lead free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
    d. PEX-a to Flange Transition: Two-piece fitting with one steel flange conforming to ASME B 16.5 and one lead free (LF) brass adapter conforming to ASTM F 1960.
    e. PEX-a to Groove Transition: One-piece lead free (LF) brass fitting with one CSA B242-05 groove end in either iron pipe size (IPS) or copper tube size (CTS) and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
    f. PEX-a to Water Meter Transition: Two-piece fitting with one NPSM union thread and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

G. PEX-to-Thermoplastic Transition Fittings:

1. PEX-a to CPVC Transition: Thermoplastic fitting with one spigot or socket end and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

2.4 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. EPCO Sales, Inc.
d. Hart Industries International, Inc.
e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
f. Zurn Plumbing Products Group; Wilkins Water Control Products.

2. Description:

a. Pressure Rating: 150 psig at 180 deg F.
b. End Connections: Solder-joint copper alloy.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. EPCO Sales, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Factory-fabricated, bolted, companion-flange assembly.
b. Revise pressure rating in first subparagraph below to suit Project or insert other options for specific applications.
c. Pressure Rating: 175 psig minimum.
d. End Connections: Solder-joint copper alloy; threaded solder-joint copper alloy.

D. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.

2. Description:

    a. Nonconducting materials for field assembly of companion flanges.
    b. Pressure Rating: 150 psig.
    c. Gasket: Neoprene or phenolic.
    d. Bolt Sleeves: Phenolic or polyethylene.
    e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Calpico, Inc.
    b. Lochinvar Corporation.

2. Description:

    a. Galvanized-steel coupling.
    b. Pressure Rating: 300 psig at 225 deg F.
    c. End Connections: Female threaded.
    d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Perfection Corporation; a subsidiary of American Meter Company.
    b. Precision Plumbing Products, Inc.
    c. Sioux Chief Manufacturing Co., Inc.
    d. Victaulic Co. of America.
    e. Allpass Corporation

2. Description:

    a. Electroplated steel nipple complying with ASTM F 1545.
    b. Pressure Rating: 300 psig at 225 deg F.
    c. End Connections: Male threaded or grooved.
    d. Lining: Inert and noncorrosive, propylene.

2.5 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Hyspan Precision Products, Inc.
4. Mercer Rubber Co.
5. Metraflex, Inc.

B. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome plated.

E. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.7 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.8 SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Molded-PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

D. Molded-PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

E. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

F. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

G. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.9 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved by engineer.

B. Install copper tubing buried within 5 feet of building according to CDA's "Copper Tube Handbook."

C. Install copper tubing buried within 5 feet of building in PE encasement according to ASTM A 674 or AWWA C105.

D. Install shutoff valve inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure-reducing valves.

G. Install domestic water piping level and plumb.

H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

I. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

K. Install piping adjacent to equipment and specialties to allow service and maintenance.

L. Install piping to permit valve servicing.

M. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

N. Install piping free of sags and bends.

O. Install fittings for changes in direction and branch connections.

P. Install PEX piping with loop at each change of direction of more than 90 degrees.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install pressure gages on suction and discharge piping from each plumbing pump and packaged booster pump. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages.

S. Install adjustable aquastat in hot-water circulation piping. Refer to detail on drawings. Comply with requirements in Division 22 Section "Domestic Water Pumps" for aquastats.

T. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

U. Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings, including the following:

1. Manufacturer’s Piping Systems Installation Guide, current edition.
2. Manufacturer’s Plumbing Design Assistance Manual, current edition.

V. Install PEX piping system in compliance with the Manufacturer’s Plumbing Design Assistance Manual (PDAM), current edition, and the Manufacturers Piping Systems Installation Guide, current edition.

W. PEX shall not be installed in areas within five feet of a UV light source, such as LED and fluorescent light fixtures or other UV generating devices.

X. PEX shall not be installed outdoors where it is exposed to direct sunlight light for more than 30 days.

Y. PEX piping shall be installed per ASTM E84 requirements for plenum applications.

Z. Install PEX-a Pipe Support and provide all required hangers and supporting strapping as required by manufacturer to provide a code compliant installation.

AA. Install PEX piping in straight runs free of sags and kinks and provide bend supports at all 1/2" and 3/4" drops.

BB. All PEX piping penetrations through wall plates shall be protected or shielded as required to prevent damage to piping.

CC. PEX tubing passing through metal studs shall use grommets or sleeves at the penetration.

DD. Install PEX piping from the multiport tee or manifold to each fixture as a home run.

EE. Install PEX-a Pipe Support, fixed anchor points and hangers in compliance with Manufacturer's Plumbing Design Assistance Manual (PDAM) to minimize expansion and contraction.

FF. Install PEX piping at each fixture with out of the wall support bracket to secure piping and prevent excess movement when water stops or shut valves are operated.

GG. Install all PEX Manifolds centered in access panels to permit servicing.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

E. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

F. Copper-Tubing Grooved Joints: Roll groove end of tube. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for roll-grooved joints.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. PVC Piping: Join according to ASTM D 2855.

I. PEX Piping Joints: Join according to ASTM F 1960.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller. Use ball or butterfly valves for piping NPS 2 ½" up to NPS 4". Use butterfly valves for piping NPS 4" and larger.

C. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Refer to detail on plans for additional information. Set calibrated balancing valves partly open to restrict but not stop flow. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for calibrated balancing valves.

3.5 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.
2. NPS 2 and Larger: Sleeve-type coupling.

3.6 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.7 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors at suction and discharge manifold connections to each domestic water booster pump.

B. Install stainless-steel-hose flexible connectors in domestic water piping.

3.8 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:
   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod

E. Install supports for vertical copper tubing every 10 feet.

F. Hangers and Supports

G. Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings, including the following:
1. Manufacturer's Piping Systems Installation Guide, current edition.
2. Manufacturer's Plumbing Design Assistance Manual, current edition.

H. PEX-a Hangers and Supports:

1. Horizontal PEX-a piping: Install supports suitable for PEX-a piping in compliance with local codes and the Manufacturer's Piping Systems Installation Guide (current edition).
   a. Note: Per ICC PMG-1006, the above maximum hanger spacing requirements may be extended with the use of a continuous support channel such as Uponor PEX-a Pipe Support or equal.
2. Horizontal PEX-a piping with PEX-a Pipe Support: Install supports for PEX-a piping with horizontal support channel in accordance with manufacturer's recommendations and the following maximum spacing:
   a. 3-inch nominal and smaller: Maximum span, 8 feet (2.4 m).
   b. Support 1½ inch and smaller fittings within 12 inches (0.3 m).
   c. Install clamps and fixed points per the Manufacturer's Piping Systems Installation Guide, current edition.
3. Vertical PEX-a piping: Install supports suitable for PEX-a piping in compliance with local codes and the Manufacturer's Piping Systems Installation Guide (current edition):
   a. Support vertical in-wall piping every 5 feet (1.5 m).
   b. Support riser piping at the base of each floor and every 5 feet (1.5 m) vertically.
      1) Refer to the Manufacturer's Piping Systems Installation Guide for additional requirements.

I. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to new or existing water-service piping or as otherwise indicated on plans. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
3. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.10 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors where piping is exposed to view and at all plumbing fixtures according to the following:

1. New and Existing Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: Split-casting or one-piece, cast-brass type with polished chrome-plated finish and set screw.
c. Insulated Piping at Wall and Ceiling Penetrations where exposed to view: One-piece or split-plate, stamped-steel type with spring clips or set screw.
d. Bare Piping at Wall and Ceiling Penetrations where exposed to view: One-piece or split-plate, stamped-steel type with spring clips or set screw.
e. Insulated or Bare Piping at Floor Penetrations where exposed to view: One-piece or Split-Casting, floor-plate type.

3.11 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Molded PE or PVC.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe or Stack sleeve fittings.

    a. Extend sleeves 2 inches above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

    a. PVC pipe, Steel pipe sleeves for pipes smaller than NPS 6
    b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Concrete Roof Slabs: Molded PE or PVC.
5. Sleeves for Piping Passing through Exterior Concrete Walls:

    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Cast-iron wall pipe sleeves for pipes NPS 6 and larger.
    c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
    d. Do not use sleeves when wall penetration systems are used.

6. Sleeves for Piping Passing through Interior Concrete Walls:

    a. PVC pipe, Steel pipe sleeves for pipes smaller than NPS 6.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestop materials and installations.

3.12 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.13 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

3.14 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Re-inspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections, and arrange for re-inspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and

allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.

5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.15 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Adjust calibrated balancing valves to flows indicated.

4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.16 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.17 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use ball or butterfly valves for piping NPS 2 ½" up to NPS 4". Use butterfly valves for piping NPS 4" and larger.
2. Hot-Water Circulation Piping, Balancing Duty: Calibrated, memory-stop balancing valves.
3. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Grooved-end valves may be used with grooved-end piping.

END OF SECTION

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.

B. Related Sections include the following:

1. Division 22 Section "Sanitary Sewerage Pumps."

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. LLDPE: Linear, low-density polyethylene plastic.

D. NBR: Acrylonitrile-butadiene rubber.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. TPE: Thermoplastic elastomer.

1.4 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water

1.5 SUBMITTALS

A. Product Data: For each type of product indicated: pipe, tube, fittings, and couplings.

B. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties with sealing plugs in ends or with end protection.

B. Do not store plastic pipe or fittings in direct sunlight.

C. Protect pipe, fittings, and seals from dirt and damage.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Neutralization-Tank, Trap Limestone: Equal to 200 percent of amount required for each tank sump initial charge. Furnish limestone in 50-lb bags.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified. Alternate manufacturers require engineer pre-approval by written addendum.

1. Copper Piping:

Pipe	Fittings
1. Mueller	1. Mueller
2. Halstead	2. Elkhart
3. Reading	3. Nibco

2. Cast Iron Piping:

Pipe	Fittings
1. Tyler	1. Tyler
2. Charlotte	2. Charlotte

3. New Age	3. New Age
4. AB & I	4. AB & I

3. Plastic Piping:

Pipe	Fittings
1. Charlotte	1. Charlotte
2. Nibco	2. Nibco
3. Jetstream	3. RG Sloane

2.2 PIPING & FITTINGS

A. Sanitary Sewer Piping, Buried Beyond 5 Feet of Building:

1. Cast Iron Pipe: ASTM A74 and CISPI HS, service weight.

a. Fittings: Cast iron.
b. Joints: Hub-and-spigot, CISPI HSN and ASTM C564 compression type with elastomeric gaskets.

2. Solid-Wall PVC Pipe: ASTM D2665, Schedule 40 DWV.

a. Fittings: ASTM D3311, PVC.
b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

B. Sanitary Drain, Waste, And Vent Piping, Buried Within 5 Feet of Building:

1. Cast Iron Pipe: ASTM A74 and CISPI HS, service weight.

a. Fittings: Cast iron.
b. Joints: Hub-and-spigot, CISPI HSN and ASTM C564 compression type with elastomeric gaskets.

2. Solid-Wall PVC Pipe: ASTM D2665, Schedule 40 DWV.

a. Fittings: ASTM D3311, PVC.
b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

C. Sanitary Drain, Waste, And Vent Piping, Above Grade:

1. Cast Iron Pipe: ASTM A74 and CISPI HS, service weight.

a. Fittings: Cast iron.
b. Joints: Hub-and-spigot, CISPI HSN and ASTM C564 compression type with elastomeric gaskets.

2. Cast Iron Pipe: ASTM A888 or CISPI 301, hubless, service weight.

a. Fittings: Cast iron.
b. Joints: Heavy-Duty, Shielded, Stainless-Steel Couplings shall conform to ASTM A-888, 3 inches wide for nominal pipe sizes 1½ to 4 inches in diameter, 4 inches

wide for nominal pipe sizes 5 to 10 inches in diameter. Shields shall have a minimum thickness of 0.015 inches, (28 gauge) type 304 stainless steel. Worm drive clamps shall be type 304 stainless with a minimum clamp torque of 80 in/lbs. Sealing Gasket shall be neoprene conforming to ASTM C-564. Couplings shall conform to Factory Mutual Standard 1680, Class 1, ASTM-1540, or ASTM C-1277, as manufactured by Clamp-All Products Models HI-TORQ 125 and HI-TORQ 80; or Husky Technologies Model SD-4000.

1) Alternative to above, cast iron split clamps secured by stainless steel bolts and nuts with neoprene gasket conforming to ASTM C-564; as manufactured by MG Coupling Company.
2) Factory Mutual Approved Coupling may be hung with one hanger per length of pipe for 10-foot lengths and at every third fitting where they are contiguous in conformance with manufacturers installation instructions.

3. Solid-Wall PVC Pipe: ASTM D2665, Schedule 40 DWV.

a. Fittings: ASTM D3311, PVC.
b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement

NOTE: PVC piping is not allowed in return air plenums. Piping that must run in plenums shall be cast iron or copper with DWV fittings. With approval of authority having jurisdiction, PVC piping may be insulated per section 220700.

D. Acid Waste and Vent Piping, Buried:

1. Polypropylene (PP) pipe: ASTM D4101 non-flame retardant polypropylene, manufactured to schedule 40 pipe dimensions, cylindrical, straight, minimum 10-foot-long sections.

a. Fittings: Socket ends, ASTM D4101 fire retardant polypropylene, manufactured to schedule 40 pipe dimensions, conform to ASTM D3311 tolerances.
b. Joints: ASTM D2657, socket heat fusion.
c. Pipe and fittings shall be supplied by the same manufacturer.

E. Acid Waste and Vent Piping, Above Grade:

1. Polyvinylidene Fluoride (PVDF) Pipe: ASTM D3222 flame retardant PVDF material, manufactured to schedule 40 pipe dimensions, cylindrical, straight, minimum 10-foot long sections. Piping material shall be certified to meet ASTM E-84 and UL 723 standards for flame spread and smoke generation. Piping shall be approved for return air ceiling plenum applications.

a. Fittings: Socket ends, ASTM D3222 fire retardant PVDF material, manufactured to schedule 40 pipe dimensions, conform to ASTM D3311 and F1673 tolerances
b. Joints: ASTM D2657, socket heat fusion; Mechanical joints at accessible fixture connections.
c. Joints: ASTM D2657, socket heat fusion; Mechanical joints at accessible fixture connections.

2. Neutralizing Tank – Orion Style number seven. Fiberglass reinforced circular closed top with integral 17” diameter bolted manhole. Fiberglass outer wrap, polyethylene inner

surface. Furnish with optional extension and steel trap door. 4" inlet and outlet, 3" side vent – 200-gallon capacity (36" diameter x 53" height). 2500 Lbs. of limestone chips. See drawings for installation detail.

3. Neutralizing Trap – Orion Style number eight. Point of use acid trap were indicated on the drawings. 1½ gallon capacity, 10" x 9" x 6" inside dimensions. 1½" inlet-outlet piping connections, integral 3" diameter side cleanout. Furnish with supply of limestone chips.

F. Storm Water Piping, Buried Beyond 5 Feet of Building:

1. Cast Iron Pipe: ASTM A74 and CISPI HS, service weight.

   a. Fittings: Cast iron.
   b. Joints: Hub-and-Spigot, CISPI HSN and ASTM C564 compression type with neoprene gaskets.

2. PVC Pipe: ASTM D2665, Schedule 40 DWV.

   a. Fittings: ASTM D3311, PVC.
   b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

3. Exterior Roof Drain/Storm Water Sewer Piping: Schedule 40 PVC with drainage pattern fittings. Piping up to 10" in size shall have solvent welded joints. Piping larger than 10" shall have gasketed joints. Piping installed underneath paved areas with vehicle access and having less than 24" of ground cover shall be reinforced concrete pipe (RCP). Concrete headwalls, splash blocks, curb inlets, and catch basins by General Contractor.

G. Storm Water Piping, Buried Within 5 Feet of Building:

1. Cast Iron Pipe: ASTM A74 and CISPI HS, service weight.

   a. Fittings: Cast iron.
   b. Joints: Hub-and-spigot, CISPI HSN and ASTM C564 compression type with elastomeric gaskets.

2. PVC Pipe: ASTM D2665, Schedule 40 DWV

   a. Fittings: ASTM D3311, PVC.
   b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

H. Storm Water Piping Above Grade:

1. Cast Iron Pipe: ASTM A74 and CISPI HS, service weight.

   a. Fittings: Cast iron.
   b. Joints: Hub-and-spigot, CISPI HSN and ASTM C564 compression type with elastomeric gaskets.

2. Cast Iron Pipe: CISPI 301 or ASTM A888, hubless, service weight.

   a. Fittings: Cast iron.
   b. Joints: Couplings shall conform to ASTM A-888, 3 inches wide for nominal pipe sizes 1½ to 4 inches in diameter, 4 inches wide for nominal pipe sizes 5 to 10 inches

in diameter. Shields shall have a minimum thickness of 0.015 inches, (28 gauge) type 304 stainless steel. Worm drive clamps shall be type 304 stainless with a minimum clamp torque of 80 in/lbs. Sealing Gasket shall be neoprene conforming to ASTM C-564. Couplings shall conform to Factory Mutual Standard 1680, Class 1, ASTM-1540, or ASTM C-1277, as manufactured by Clam-All Products Models HI-TORQ 125 and HI-TORQ 80; or Husky Technologies Model SD-4000

1) Alternative to above, cast iron split clamps secured by stainless steel bolts and nuts with neoprene gasket conforming to ASTM C-564; as manufactured by MG Coupling Company.
2) Factory Mutual Approved Coupling may be hung with one hanger per length of pipe for 10-foot lengths and at every third fitting where they are contiguous in conformance with manufacturers installation instructions.

3. PVC Pipe: ASTM D2665, Schedule 40 DWV

a. Fittings: ASTM D3311, PVC.
b. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

I. Condensate Drain Piping:

1. Schedule 40 PVC pipe with drainage pattern fittings. Solvent weld joints. Piping in return air plenum shall be Type “L” hard copper tubing with drainage pattern fittings or insulated with fire wrap insulation equal to Fyre Wrap 0.5. Plenum insulation as manufactured by UniFrax. Install pipe without sags or bow-ups. Provide intermediate supports as required. Install drain piping at equipment per manufacturer’s printed installation instructions. Install necessary traps and cleanout plugs as required. Install cleanouts at each 90-degree turn.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

B. Verify that excavations are to required grade, dry and not over-excavated.

3.2 PREPARATION:

A. Ream pipe and tube ends. Remove burrs.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 PIPING INSTALLATION

A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install in accordance with manufacturer’s instructions.

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers

D. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

E. Route piping in orderly manner and maintain gradient. Run harmoniously with the building walls and ceilings.

F. Provide clearance for installation of insulation and access fittings.

G. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

H. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."

I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch, and 1/8-bend fittings if 2 fixtures are installed back-to-back or side by side with common drainpipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing

M. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

N. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

3.6 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.

2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

H. Install supports for vertical copper tubing every 10 feet.

I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 48 inches with 7/8-inch rod.

J. Install supports for vertical PVC piping every 48 inches.

K. Install vinyl-coated hangers for PP piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2: 33 inches with 3/8-inch rod.
2. NPS 2-1/2 and NPS 3: 42 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.
5. NPS 8: 48 inches with 7/8-inch rod.

L. Install supports for vertical PP piping every 72 inches.

M. Install vinyl-coated hangers for PVDF piping with the following maximum horizontal spacing and minimum rod diameters:

1. All Sizes: Install continuous support for piping with liquid waste at temperatures above 140 deg F.
2. NPS 1/2 and Smaller: 30 inches with 3/8-inch rod.
3. NPS 3/4 to NPS 1-1/2: 36 inches with 3/8-inch rod.
4. NPS 2: 36 inches with 3/8-inch rod.
5. NPS 2-1/2 and NPS 3: 42 inches with 1/2-inch rod.
6. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.

7. NPS 6: 48 inches with 3/4-inch rod.

N. Install supports for vertical PVDF piping NPS 1-1/2 every 48 inches and NPS 2 and larger every 72 inches.

O. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 NEUTRALIZATION TANK INSTALLATION

A. Install recessed neutralization tanks, complete with appurtenances indicated.

1. Set tops of tank covers flush with finished surface where covers occur in finished floors or pavement. Set covers 3 inches above finished surface elsewhere unless otherwise indicated.
2. Include initial fill of limestone for neutralization tanks.

B. Install floor mount neutralization tanks on smooth and level floor surface. Include full initial charge of limestone.

3.8 NEUTRALIZATION TRAP INSTALLATION

A. Install neutralization traps at each fixture indicated in accordance with manufacturer's instructions.

3.9 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to existing sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

3.10 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections, and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.11 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.12 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drainage systems.
3. Roof Drainage.
4. Roof flashing assemblies.
5. Through-penetration firestop assemblies.
6. Miscellaneous sanitary drainage piping specialties.
7. Flashing materials.

B. Related Sections include the following:

1. Division 22 Section "Storm Drainage Piping Specialties"
2. Division 22 Section "Plumbing Fixtures".

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

A. Product data for drainage piping specialties.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.6 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Zurn
b. Josam
c. J.R. Smith
d. Wade
e. Watts

Full size of pipe up to 4". Locate at base of vertical stacks, ends of main, changes in directions greater than 135 degrees. Install cleanouts at a maximum of every 100 linear feet in all waste piping inside and outside of building.

Finished walls - Zurn Z-1468 stainless steel wall access cover complete with securing screw and bronze raised hex head plug.

Finished floors - Zurn Z-1400- adjustable floor level cleanouts - polished bronze top.

Carpeted floors - Zurn Z-1400 - adjustable floor level cleanout - polished bronze top - carpet marker.

Outside building - heavy-duty cleanout with cast iron top - threaded bronze or PVC tapered plug - set in reinforced concrete collar.

2.2 FLOOR DRAINAGE SYSTEMS

A. Floor Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Zurn
b. Josam
c. J.R. Smith
d. Wade
e. Watts

Zurn ZN-415-BZ: Dura-coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with seepage slots. “Type BZ” polished nickel bronze, light-duty, leveling round strainer for general floor drains including those installed in linoleum or asphalt/VCT tile floors - 2" & 3” drains to have 5" strainer, 4" drains to have 6" strainer.

Zurn ZN-415-SZ: Dura-coated cast iron body with bottom outlet, combination invertible membrane clamp and adjustable collar with seepage slots. “Type SZ” polished nickel bronze, light duty, square leveling strainer for installation in ceramic tile, quarry tile or terrazzo floors.

Zurn Z-611 as marked B.D. on plans. 9” square top drain, dura-coated cast iron body with bottom outlet, seepage pan and combination membrane flashing clamp and frame for cast iron medium-duty slotted grate, with suspended sediment bucket. Drains marked A.D. (area drain) on plans are to be installed without trap when used in exterior applications.

Furnish Zurn Z-1724 4” round, type 304 stainless steel funnel with satin finish at all drains noted on plans as “with funnel”.

Deep seal P-trap. Furnish with trap primer connection as required by local codes or where shown on the plumbing drawings. Drains equipped with trap guard seals do not require trap primer connection.

General Contractor to locate and set elevations for drains, no deviation made from this without permission of the Architect.

B. Floor Sinks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Zurn
b. Josam
c. J.R. Smith

d. Wade
e. Watts

12x12x8 deep cast iron body and square light duty grate with ½" slotted openings, white acid resisting porcelain enamel interior and top, complete with aluminum anti-splash interior bottom dome strainer. Floor sinks with indirect waste connections shall be set with the open part of the grate under the equipment so that the indirect piping is out of the way. Verify kitchen (and other) equipment sizes and orientation so that floor sinks are located to catch all drainage associated with each piece of equipment.

FS: Zurn model Z-1901-3 (12"x12"x8") with ¾ grate.
FS-2: Zurn model Z-1901 (12"x12"x8") with full grate.
FS-3: Zurn model ZN-1901-11-HP (12"x12"x8") with nickel-bronze top, vandal resistant with heel-proof grate.

Deep seal P-trap. Furnish with trap primer connection as required by local codes or where shown on the plumbing drawings. Trap primer connection is not required where trap seals are used.

General Contractor to locate and set elevations for drains, no deviation made from this without permission of the Architect.

2.3 ROOF DRAINAGE

A. Roof Drains and Overflow Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Zurn
b. Josam
c. J.R. Smith
d. Wade
e. Watts

B. Dura-coated cast iron body with combination membrane flashing clamp/gravel guard and low silhouette mushroom type cast-iron dome. Sump receiver, under deck clamp, and extension where required. Provide 2" internal water dam for overflow drains. Equal to Zurn Model Z-100.

1. Install a Zurn Z-199 downspout nozzle with wall flange where pipe goes through wall to splash block. Splash block by General Contractor.

2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch-thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.

2.5 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. ProSet Systems Inc.
    b. Engineer pre-approved equal.

2. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
3. Size: Same as connected soil, waste, or vent stack.
4. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
5. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
6. Special Coating: Corrosion resistant on interior of fittings.

2.6 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2: 4-inch- minimum water seal.
    b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

B. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.

2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

C. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

E. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.7 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Copper Sheet: ASTM B 152/B 152M, of the following minimum weights and thicknesses, unless otherwise indicated:

1. General Applications: 12 oz./sq. ft.
2. Vent Pipe Flashing: 8 oz./sq. ft.

C. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

D. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

E. Fasteners: Metal compatible with material and substrate being fastened.

F. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

G. Solder: ASTM B 32, lead-free alloy.

H. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Interior Roof Drainage Piping: Install cleanouts at base of each riser, (a minimum of 6" above the finished floor elevation), ends of main, and changes in direction greater than 45 degrees. Install cleanouts at a maximum of every 100 linear feet in all piping inside and outside of building.

G. Grade roof drainage piping uniformly and install at 1/8" fall per foot unless indicated otherwise on drawings.

H. Install roof flashing assemblies or flashing fittings on sanitary stack vents and vent stacks that extend through roof.

I. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations where required to maintain fire rating. Refer to architectural code review plan for additional information.

J. Base final installation of all materials and equipment on jobsite dimensions and conditions. Jobsite dimensions shall take precedence over drawing dimensions. Coordinate placement with other trades.

K. Install deep-seal traps on floor drains and other waste outlets.

L. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection. Drains equipped with trap guard seals do not require trap primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

M. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

N. Install wood-blocking reinforcement for wall-mounting-type specialties.

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

P. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain grease removal devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 221323 - SANITARY WASTE INTERCEPTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of interceptors outside the building: Adjust list below to suit Project.

1. Mud/Oil Interceptors.

1.3 SUBMITTALS

A. Shop Drawings: For each type and size of precast concrete interceptor indicated.

1. Include materials of construction, dimensions, rated capacities, retention capacities, location, and size of each pipe connection, furnished specialties, and accessories.

B. Coordination Drawings: Interceptors, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Interceptors.
2. Piping connections. Include size, location, and elevation of each.
3. Interface with underground structures and utility services.

PART 2 - PRODUCTS

2.1 MUD/OIL INTERCEPTOR

A. Striem oil separator model OS-100. Separator shall be constructed of polyethylene. Separator shall be manufactured for above- or below-grade installation. Field-adjustable riser system is available as an option to bring manhole covers to grade. Separator flow rate shall be 100 GPM. Separator liquid holding capacity shall be 250 gallons and oil capacity shall be 144 gallons. Solids capacity shall be 95 gallons. Covers shall provide water/gas-tight seal and have a maximum 16,000 lbs. load capacity.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 22 Section "Earth Moving."

3.2 INSTALLATION

A. Install interceptor inlets and outlets at elevations indicated and/or required by plans.

B. Install precast concrete interceptors according to ASTM C 891. Set level and plumb.

C. Install manhole risers from top of underground concrete interceptors to manholes at finished grade.

D. Set tops of manhole frames and covers flush with finished surface in pavements. Set tops 3 inches above finish surface elsewhere, unless otherwise indicated.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Make piping connections between interceptors and piping systems.

3.4 IDENTIFICATION

A. Identification materials and installation are specified in Division 22 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.

1. Use warning tapes or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

END OF SECTION

SECTION 223300 - ELECTRIC DOMESTIC WATER HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following electric water heaters:

1. Instantaneous electric water heaters.
2. Light-commercial electric water heaters.
3. Commercial, storage electric water heaters.
4. Compression tanks.
5. Water heater accessories.

1.3 SUBMITTALS

A. Product Data: For each type and size of water heater indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. LEED Submittal:

1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with ASHRAE/IESNA 90.1-2019, Section 7 - "Service Water Heating."

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Product Certificates: For each type of commercial electric water heater, signed by product manufacturer.

E. Source quality-control test reports.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For electric water heaters to include in emergency, operation, and maintenance manuals.

H. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain same type of electric water heaters through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of electric water heaters and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. ASHRAE/IESNA 90.1-2019 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2019.

E. ASME Compliance: Where indicated, fabricate and label commercial water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

F. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9," for all components that will be in contact with potable water.

1.5 COORDINATION

A. Coordinate size and location of concrete bases with Architectural and Structural Drawings.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Period(s): From date of Substantial Completion:

a. Instantaneous Electric Water Heaters:

1) Heat Exchanger: Five-years
2) Controls and Other Components: One-year.

b. Light-Commercial Electric Water Heaters:

1) Storage Tank: Three years.
2) Controls and Other Components: One-year.

c. Commercial Electric Water Heaters:

1) Storage Tank: Three years.
2) Controls and Other Components: One-year.

d. Compression Tanks: **One**-year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 LIGHT-COMMERCIAL ELECTRIC WATER HEATERS

A. Description: Comply with UL 174 for household, storage electric water heaters.

1. Manufacturers:

a. Lochinvar Corporation.
b. Rheem Water Heater Div.; Rheem Manufacturing Company.
c. Ruud Water Heater Div.; Rheem Manufacturing Company.
d. Smith, A. O. Water Products Company.
e. State Industries, Inc.

2. Storage-Tank Construction: Steel, vertical arrangement.

a. Tappings: ASME B1.20.1 pipe thread.
b. Pressure Rating: 150 psig.
c. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending lining material into tappings.

3. Factory-Installed Storage-Tank Appurtenances:

a. Anode Rod: Replaceable magnesium.
b. Dip Tube: Provide unless cold-water inlet is near bottom of tank.
c. Drain Valve: ASSE 1005.
d. Insulation: Comply with ASHRAE/IESNA 90.1-2019.
e. Jacket: Steel with enameled finish.
f. Heat Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
g. Heating Elements: Two; electric, screw-in immersion type; wired for simultaneous operation, unless otherwise indicated.
h. Temperature Control: Adjustable thermostat for each element.
i. Safety Control: High-temperature-limit cutoff device or system.

j. Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3 for combination temperature and pressure relief valves. Include relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select relief valve with sensing element that extends into storage tank.

4. Capacity and Characteristics: Refer to schedules on plans.

2.3 COMPRESSION TANKS

A. Description: Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.

1. Manufacturers:

a. AMTROL Inc.
b. Taco, Inc.
c. Watts Regulator Co.
d. Engineer pre-approved equal

2. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

3. Capacity and Characteristics: Refer to schedules on plans.

2.4 WATER HEATER ACCESSORIES

A. Combination Temperature and Pressure Relief Valves: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and include pressure setting less than water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

B. Water Heater Mounting Brackets: Water heater manufacturer's factory-fabricated steel bracket for wall mounting and capable of supporting water heater and water.

C. Drain Pans: Corrosion-resistant metal with raised edge. Provide dimensions not less than base of water heater and include drain outlet not less than NPS 3/4.

D. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1-2019.

2.5 SOURCE QUALITY CONTROL

A. Hydrostatically test water heater storage tanks before shipment to minimum of one and one-half times pressure rating.

B. Prepare test reports.

PART 3 - EXECUTION

3.1 WATER HEATER INSTALLATION

A. Install water heaters on concrete bases.

1. Exception: Omit concrete bases for water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.
2. Concrete base construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.

C. Install combination temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap into nearest floor receptor.

D. Install combination temperature and pressure relief valves in water piping for water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic water piping in continuous downward pitch, and discharge by positive air gap into nearest floor receptor.

E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Domestic Water Piping Specialties" for hose-end drain valves.

F. Install thermometer on inlet and outlet piping of water heaters. Refer to Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

G. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.

H. Fill water heaters with water.

I. Charge compression tanks with air.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to water heaters to allow service and maintenance. Arrange piping for easy removal of water heaters.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace water heaters that do not pass tests and inspections and retest as specified above.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain commercial electric water heaters. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION

SECTION 224000 - PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plumbing Fixtures and Trim
2. Installation and Connection

1.3 SUBMITTALS

A. Product Data: Product Data: Submit product data for the following, specified under Division 01 Section “Submittal Procedures”.

1. Plumbing Fixtures and Trim

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Plumbing Fixtures (Vitreous China)

1. Kohler
2. American Standard
3. Zurn
4. Sloan
5. Gerber

B. Plumbing Fixtures (Stainless Steel)

1. Elkay
2. Just

C. Faucets

1. Delta
2. Sloan
3. American Standard

4. Zurn

D. Closet Seats

1. Church
2. Bemis

E. Mop Basin

1. Fiat (Molded Stone)
2. Stern-Williams (Terrazzo)

F. Electric Water Cooler

1. Elkay
2. Oasis
3. Haws
4. Halsey-Taylor
5. Murdock

G. Flush Valves

1. Sloan G2 Optima Plus (Sensor)
2. Sloan Royal (Manual)
3. Zurn ZER6000AV-TM (Sensor)
4. Zurn Z6000AV (Manual)

H. Mixing Valves

1. Leonard
2. Symmons
3. Powers, a Watts Brand
4. Acorn

I. Carriers

1. Zurn
2. Wade
3. Josam
4. J. R. Smith
5. Watts

2.2 FIXTURES

Furnish and install plumbing fixtures as shown on drawings and as herein specified.

Fixtures indicated by P-number to be connected, set true, leveled, left clean and ready for use.

All vitreous china fixtures shall be standard white unless otherwise indicated on the Plumbing Fixture Schedule.

All fixtures and accessories designated to be ADA compliant shall conform to the Americans with Disabilities Act. See the drawings for locations and mounting heights.

PART 3 - EXECUTION

3.1 PREPARATION

A. Base final installation of all materials and equipment on jobsite dimensions and conditions. Jobsite dimensions shall take precedence over drawing dimensions.

B. Verify and coordinate all fixture sizes and mounting requirements with architectural drawings and cabinet details prior to submitting shop drawings or ordering fixtures. No change orders will be allowed due to lack of coordination with actual installation requirements.

3.2 INSTALLATION

A. General: Install each fixture with trap, easily removable for servicing and cleaning.

Provide chrome plated rigid supplies to fixtures with screwdriver stops, reducers, and escutcheons.

Install hose and faucet connections with vacuum breaker.

Install additional blocking for support of all wall hung fixtures. (Unless wall carrier is specified with fixture.)

Install offset drains at all handicapped lavatories and sinks.

Install P-traps from handicapped lavatories and sinks back at wall to allow maximum clearance for wheelchair access. Refer to architectural drawings for clearance required for wheelchair access. Install True-Bro Model 102 and accessory 105 ADA compliant factory insulation kit on exposed piping if not covered by architectural skirt panel.

All handicapped sinks shall be furnished with off-center drain locations.

Securely anchor all flush valves behind or within walls to be absolutely rigid and not subject to movement due to push or pull action of valve.

Provide elongated bowl with open front seat, less cover, on all water closets unless otherwise indicated on the Plumbing Fixture Schedule.

Urinals to have top spud inlet unless otherwise scheduled.

Trip levers on all water closets designated to be ADA compliant shall be on the open or accessible side of the fixture.

All faucets shall be furnished with internal hot water limit stops to prevent scalding. Limit stops shall be field adjustable.

All trap arm connections to plumbing fixtures shall be cast iron, brass, or copper. PVC shall only be used where allowed by other divisions of these specifications.

3.3 FIXTURE CONNECTIONS

Refer to Plumbing Fixture Schedule on drawing for sizes.

END OF SECTION

SECTION 230500 – COMMON WORK RESULTS FOR HVAC

PART 1 – GENERAL

The Engineer retains ownership of all copies of drawings and specifications. These documents shall not be used for work other than for the specific project identified by the Engineer's project number.

The Contractor shall return all copies of drawings and specifications to the Engineer at completion of the project or upon the Engineer's request.

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.2 MECHANICAL SCOPE OF WORK

Provide all mechanical systems indicated by the drawings, specified, or reasonably implied. Unless specified otherwise, provide all labor, materials, and equipment necessary for completely finished and operational mechanical systems. Provide all incidental items required as part of the work even though not specified or indicated.

Where work or materials are specified, or shown on Drawings, to be performed by more than one Contractor or Subcontractor, each such Contractor will be deemed to have figured the item and the Architect will determine who shall furnish the work and who shall submit the credit to the Owner.

1.3 WORK BY GENERAL CONTRACTOR

A. Painting: All painting except as specified under Pipe Identification.

B. Wall Openings, and Chases: Provide openings, and chases, and provide framing for them as directed by Mechanical. Pipe sleeves shall be furnished by Mechanical Contractor.

C. Structural Framing/Reinforcing: Provide additional structural framing and reinforcing as required for all roof mounted or suspending piping and mechanical equipment.

D. Access Panels: Install access panels where required to be furnished under this Division.

E. Concrete Housekeeping Pads: Provide concrete pads for all base mounted mechanical equipment. Concrete pads shall extend a minimum of 6" longer than the equipment footprint (unless noted otherwise on the drawings).

F. Exterior Wall Louvers: Install all exterior wall louvers and brick vents as provided by Mechanical.

1.4 WORK BY ELECTRICAL CONTRACTOR

The Electrical Contractor will furnish and install all line voltage power wiring, wire mold, conduit, and all rough-in boxes for thermostats, sensors, etc., as indicated on the drawings and specifications. In addition, the Electrical Contractor will install all push buttons, speed controls and line voltage thermostats furnished by the Mechanical Contractor that act as main controllers for full load motor or heating equipment current. The Electrical Contractor will furnish and install all disconnect switches and motor starters for all mechanical equipment. Install flexible conduit in accordance with all applicable codes, at connections to mechanical equipment subject to vibration.

A. Motor Starters shall be furnished with low voltage and overload protection on each phase leg.

B. All low voltage temperature control wiring shall be furnished and installed by the Mechanical Contractor. Low voltage control wiring shall be plenum rated and installed in a neat workmanlike manner. All control wiring shall be independently supported at minimum 4'-0" centers. Wall penetrations are to be in conduit with protective bushings. Do not crimp or bind wiring; wiring found so will be replaced. All wire nut connections shall be installed in junction boxes.

1.5 MECHANICAL/ELECTRICAL COORDINATION

The Mechanical Contractor shall forward a copy of all mechanical equipment shop drawings to the Electrical Contractor prior to ordering equipment or starting work. Manufacturer's wiring diagrams and installation data shall be included with the shop drawings. Discrepancies between the mechanical and electrical construction documents shall be addressed immediately, prior to release of all equipment. A written request for information shall be forwarded to the Architect. Equipment voltages, variable frequency drives, disconnect switches, starters, fuses, and all electrical connections shall be coordinated. The Mechanical Contractor shall identify and locate all devices that require electrical rough-in boxes and line voltage connections.

1.6 DEFINITIONS

A. "Provide" means "Contractor is responsible for the furnishing and installing of. complete in every respect".

B. "Contractor" shall mean the contractor performing work under this Division of the Specifications.

C. Finished Spaces: Spaces other than mechanical and electrical equipment room, furred spaces, pipe and duct shafts, unheated spaces below roof, spaces above ceiling, crawl spaces and tunnels.

D. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical rooms.

E. Exposed Outdoor Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions.

F. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants.

1.7 QUALITY ASSURANCE

A. Acceptable Manufacturers: Acceptable manufacturers are listed in applicable sections of the Specifications and on the drawings. The basis of design shall be the manufacturer listed on the equipment schedules. All other acceptable manufacturers are required to meet all the requirements of the contract documents, and standards of quality and performance as established by the basis of design manufacturer's product. ***Equipment manufacturers that are not listed and desire to bid applicable sections of these specifications shall obtain written prior approval prior to bidding.*** Approved manufacturers shall be listed on addendum documents. See "Instruction to Bidders."

1.8 SUBSTITUTION OF EQUIPMENT AND MATERIALS

A. Contractor's Responsibility:

1. When alternate or substitute equipment and materials are used, the contractor shall be responsible for space requirements, configurations, performances, changes in bases, supports, structural members and openings in structure and all coordination between trades that may be affected by their use. The Mechanical Contractor shall pay all construction associated cost increases brought about by substitution of mechanical equipment.

1.9 DESIGN CRITERIA

A. Drawings and Specifications: Drawings are diagrammatic in character and do not necessarily indicate every required offset, transition, valve, fitting, etc. Exact locations of systems and their elements shall be determined from the structure and the equipment, not from the drawings. Installation of HVAC, and piping systems shall be coordinated with the building structure and all construction trades. Necessary ductwork and piping modifications including additional fittings, offsets, etc. may be required to accommodate the installation of the new mechanical systems. The Mechanical Contractor shall thoroughly review the construction documents and coordinate all required clearances with the General and Electrical Contractors prior to bidding. The Mechanical Contractor shall coordinate routing of ductwork with the structural framing. Mechanical Contractor shall review structural framing shop drawings with General Contractor prior to ordering materials or fabrication of ductwork. Necessary changes in duct sizing, configuration, etc., is permissible provided that the equivalent duct free area is maintained, and scheduled system static pressures are not exceeded. Mechanical Contractor shall submit duct layout shop drawing indicating all required elbows, offsets, etc. for Engineer's review prior to installation. The Mechanical Contractor shall allow and include in their bid all associated costs for a complete and operational mechanical system. Change orders shall not be granted for additional ductwork, piping, fittings, labor, etc.

The Drawings and Specifications are complementary; what is called for in either of these, is binding as though called for by both.

Examine Drawings and Specifications for other parts of the work, and if any discrepancies occur between the plans for the work of this Division and the plans for the work of others, report such discrepancies to the Architect and obtain written instructions for any changes necessary. In the event that a discrepancy is not clarified by written instruction, the more stringent requirement of the construction documents shall be enforced. Any changes in the work covered by this Division of the Specifications made necessary by the failure or neglect of the Contractor to report such discrepancies will be made by, and at the expense of the Contractor. However, it is not the intent of the Specifications that the Contractor be responsible for the correct design of the mechanical systems.

B. Changes in Design or Installation: See the General and Supplementary Conditions for requirements pertaining to changes in design and installation. Mechanical installation will otherwise be accomplished in accordance with Contract Drawings and Specifications.

1.10 REQUIREMENTS OF REGULATORY AGENCIES

A. Permits and Fees: Pay for all permits and fees necessary and as required by City or Local regulatory agencies.

B. Codes: Work for this project to comply with federal, state, and local codes, ordinances, and regulations.

All work shall comply with the latest adopted edition of the 2021 International Plumbing, Mechanical and Building Codes, and applicable sections of the National Fire Protection Association.

Work shall be done according to applicable codes in cases of conflict between specifications, plans and codes, except where plans and specifications call for higher standards than the codes.

1.11 PRODUCT DATA AND SHOP DRAWING SUBMITTALS

A. Submit (3) copies of shop drawings for all major pieces of equipment as indicated in respective sections. One (1) original will be returned to the contractor. It shall be the contractor's responsibility and expense to make additional photocopies of the original as required for other trades and subcontractors. ***At contractors' option, electronic .pdf copies of shop drawings may be utilized in lieu of hard-copies. Electronic .pdf copies shall be submitted without requiring the utilization of contractor specific (not necessarily proprietary) job management or submittal software.***

B. Submit shop drawings and product data grouped to include complete submittal of related systems, products, and accessories in a single submittal.

C. Mark dimensions and values in units to match those specified.

D. Submit published rating or capacity, and detailed equipment drawings for fabricated items.

1. Provide certified pump curves with specified operating points clearly plotted indicating pump curve, system curve, heat developer efficiency, and horsepower.

2. Ensure pumps operate at specified system fluid temperature and fluid concentrations without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25% of mid-point of published maximum efficiency curve.

3. Millwrights Certificate: Certify that base mounted pumps have been aligned.

E. Submit complete electrical schematic and connection diagrams for each particular motor control or other electrical system. Generic diagrams are not acceptable.

F. Shop drawing submittals processed by the Engineer or Architect are not change orders; the purpose of shop drawing submittals by the Contractor is to demonstrate to the Engineer or Architect that the Contractor understands the design concept, that he demonstrates his understanding by indicating and detailing the fabrication and installation methods he intends to use.

G. Equipment shop drawings shall include manufacturer's installation requirements. The Mechanical Contractor shall not deviate from these requirements or void any equipment listings, ratings, or warranties. Discrepancies with the construction documents shall be addressed immediately, prior to release of equipment. A written request for information shall be forwarded to the Engineer.

H. If deviations, discrepancies, or conflicts between shop drawing submittals and Contract Documents, in the form of design drawings and specifications, are discovered either prior to or after shop drawing submittals are processed by the Engineer or Architect, the design drawings and specifications shall take precedence.

I. Engineer will review shop drawings and indicate any correction. Engineer's review shall not relieve contractor of the responsibility of compliance with contract documents or errors in shop drawings.

1.12 PIPING SYSTEM INSPECTIONS AND TESTS

A. Procedure: All piping shall be tested with hydrostatic or pneumatic pressure, or other means as directed in the presence of the Architect before it is concealed or covered in any way.

The Contractor shall furnish and install all plugs, caps, valves and make all temporary connections necessary to perform these tests. He shall also furnish all labor, tools, and equipment necessary to perform such tests.

Tests shall be maintained for duration of not less than 12 hours with no loss in pressure prior to inspection of joints by the Architect or local building inspector. A test log of all inspections shall be maintained at the jobsite and included in the project O&M Manual at completion of the project. This document is for owner's record and is not a submittal requiring engineer's review.

Any pinhole leaks, which develop in welded joints, shall be chipped out and re-welded. A general sweating of any joint shall be cause for rejection. It shall be completely removed and re-welded. Leaks developing at threaded joints shall require the removal and

replacement of the respective fitting, threaded joint, or both. No caulking shall be permitted of any leaking threaded joint.

B. Individual System Tests:

PIPING SYSTEM	TEST PROCEDURE	TEST PRESSURE
A. Natural Gas:		
Up to 14" W.G.	Air Test	30 PSIG
Over 14" W.G.	Air Test	60 PSIG
B. Refrigerant	Nitrogen Test	300 PSIG
C. Condensate Drains	Water Test	12’ Head
	Air Test	5 PSIG

1.13 OPERATING AND MAINTENANCE MANUALS

Submit three (3) typed copies of "Operating and Maintenance Manual" 8½" x 11" in size, bound in three-ring binders to the Architect and Engineer. Manual to have index with tab dividers for each major equipment section to facilitate locating information on specific piece of equipment. Identify all data within each section with identification numbers as they appear on drawings. At contractor’s option, electronic .pdf copies of “Operating and Maintenance Manuals” may be utilized in lieu of hard-copies provided a single hard-copy is provided to owner in addition to .pdf copy. Include as a minimum the following data:

A. Alphabetical list of all system components, with the name and address of the company responsible for servicing.

B. Manufacturer's data and each piece of equipment including:

1. Installation instructions.
2. Drawings and specifications.
3. Part List
4. Complete wiring and temperature control diagrams (as-built).
5. Marked or changed prints locating all concealed parts and all variations from the original system design.

C. Filter replacement chart:

1. Showing each piece of equipment requiring filters, type of filter and quantity.

D. Air and Water Balance Report:

1. As specified in Testing, Adjusting, and Balancing for HVAC in Section 230593 of these Specifications.

1.14 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Make provisions for the delivery and safe storage of all material and make the required arrangements with other contractors on the job for the introduction into the building of equipment too large to pass through finished openings.

B. Where materials are indicated to be furnished by others to the Contractor for installation, these materials shall be checked, and their delivery properly receipted. Assume full responsibility for the storage and safekeeping of said material from time of delivery until final acceptance.

C. Cover and protect with weatherproof materials all equipment stored outdoors.

1.15 JOB CONDITIONS

A. Examination of Premises: Examine the premises prior to bidding and become fully familiar with the existing conditions.

B. Sequencing, Scheduling: Coordinate and order the progress of all work to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit. Contractors will bear any costs resulting from defective or ill-timed work performed under this Division.

C. Protection: Close ends of all pipe and ductwork during construction to prevent entry of foreign material.

Protect insulation against dirt, water, chemical or mechanical damage before, during and after installation.

Protect all equipment against damage during construction and turn over to Owner in unblemished condition at final acceptance. All coils and air handling unit interiors shall be thoroughly cleaned of any dirt or debris that may have accumulated during construction.

D. Existing Utilities: Existing utilities are indicated as accurately as possible on the drawings. Relocation of utilities encountered and not shown on drawings will be directed by change order after being brought to the attention of the Architect. Close all openings and /or repair damage in an acceptable manner to all utilities encountered regardless of whether shown or not.

1.16 GUARANTEE

Guarantee all materials, workmanship and the successful operations of all equipment installed for a period of one (1) year from the date of substantial completion. Guarantee to repair or replace at Contractor's expense any part of the work which may show defect during that time, provided such defect is, in the opinion of the Architect, due to imperfect material or workmanship and not due to carelessness or improper use.

PART 2 - PRODUCTS

2.1 PROJECT STANDARDS FOR EQUIPMENT AND MATERIALS

A. All mechanical equipment shall be labeled UL, ETL, AGA, or other approved independent testing authority. Air conditioning equipment shall be AHRI certified.

B. It shall be the responsibility of all pressure vessel manufacturer to provide an ASME stamp on their products when called for by ASME Code or Kansas State Law (Boiler Code).

C. Unless otherwise mentioned specifically, all materials and equipment shall be of the best quality used for the purpose in commercial practice. All material and equipment shall be new, unused, and without damage.

D. Certain materials and equipment in these Specifications are specified by manufacturer and catalog numbers. The manufacturer and catalog numbers are used to establish a degree of quality and type of such equipment and material.

E. Where more than one manufacturer is given in Specifications, the manufacturer's material or equipment listed first is shown on the plans and the cost of changes, duct or piping requirements, space requirements, changes required for other trades are to be borne by the Contractor when alternate named, or approved manufacturers are used in lieu of the first named.

PART 3 – EXECUTION

3.1 INSPECTION

Inspect all work preceding the work of the Mechanical and report any defects that affect the work covered by this Division to the General Contractor. Do not proceed with the work until defects are corrected. No waiver of responsibility for defective work will be allowed due to failure to report unfavorable conditions affecting the work.

3.2 PREPARATION

A. Coordinate connection of mechanical systems with underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide connection for each service.

B. Field Measurements: Base final fabrication and installation of all materials and equipment on actual dimensions and conditions governing this work at the building. No extra compensation will be allowed on account of differences between actual dimensions and those indicated on the drawings.

3.3 INSTALLATION

A. Workmanship: Perform all work in accordance with good commercial practice. The good appearance of the finished work shall be of equal importance with its mechanical efficiency.

B. Supervision: The mechanical foreman or superintendent shall be responsible for the work of all subcontractors working under Contractor and all questions or directions will be routed through him.

C. Installation procedures:

Install mechanical equipment to facilitate maintenance and repair or replacement of equipment and components. As much as is practical, connect equipment for ease of disconnecting with minimum interference with other installations.

Confer and cooperate with other trades and coordinate the work in proper relation with theirs.

Field verify exact location, size, routing, elevation, and accessibility of existing HVAC systems. Verify sufficient space is available to install new equipment and systems as indicated on the drawings. If changes are necessary, notify architect as soon as possible and modify systems as instructed. Coordinate exact location of ceiling diffusers with lighting, fixtures, ceiling grid, etc. Coordinate ceiling cavity space carefully with all trades.

Properly size and locate all anchors, chases, recesses, and openings required for the proper installation of the work. Arrange with the proper contractors for the building of anchors, etc., and for the leaving of the required chases, recesses, and openings**.** See Section 230529 “Hangers and Supports for HVAC Piping & Equipment”.

Piping and equipment located in areas subject to freezing shall be installed in a manner to prevent freezing. Install all piping on warm side of building insulation to prevent freezing.

Unless noted otherwise, mount all exposed equipment and piping as high as possible. Conceal piping and equipment unless indicated or shown differently.

Seal all floor, wall, and roof penetrations watertight with suitable sealant. Penetrations to fire-rated assemblies shall be protected by an approved through-penetration Firestop System installed and tested in accordance with ASTM E 814, with a minimum positive pressure differential of 0.01 inch of water. The system shall have an F Rating and T Rating of not less than one hour, but not less than the required rating of the fire-rated assembly penetrated. Provide chrome-plated escutcheons at all piping penetrations to finished materials.

All materials exposed in return air plenum to comply with NFPA 90A flame spread under 25, smoke developed, and fuel contributed under 50 for return air plenums.

Place all equipment in time to avoid cutting new construction. Coordinate required openings with other trades. Undertake no cutting without architect's approval. All patching shall be structurally and aesthetically equal to the surface surrounding the area patched. Mutilation of existing building finishes caused by installation of new mechanical work shall be repaired at contractor's expense to approval of owner and/or architect.

Install equipment and systems in accordance with manufacturer's recommendations and in accordance with accepted industry standards and all applicable codes. Meet all required clearances and provide all necessary equipment accessories, bases, supports, shields, etc. for a complete installation.

Provide protective metal guards for all exposed fan assemblies, belts, and open drive equipment. Guards shall be constructed sufficiently rigid to provide the required protection and shall be noise-free when the equipment is in operation.

Install new clean filters in all heating, ventilating and air conditioning systems prior to testing and balancing.

New HVAC equipment shall not be used during construction. Contractor shall furnish all necessary temporary heating/cooling equipment and controls as required.

Do all excavating and backfill required in connection with mechanical work. After work is in place and tested, backfill, and thoroughly compact the fill around pipes in a manner to prevent future settlement.

Start-up equipment in accordance with manufacturer's instructions. Review equipment and instruct owner in proper operation of the equipment.

3.4 COMPLETION

A. Cleanup: Clean all exposed surfaces of all piping, hangers, ducts, and other exposed metal of all grease, plaster, or other foreign material.

At the completion of the work, remove from the building, the premises and surrounding streets, alleys, etc., all rubbish and debris resulting from the operations and leave all equipment spaces absolutely clean and ready for use.

Refer general requirements of this specification for procedure.

B. Acceptance Demonstration: Instruct Owner's representative(s) once, in presence of the design engineer, on the proper operation and maintenance of the mechanical systems.

Contractor's representative shall have a thorough knowledge of the installation and equipment.

3.5 FINAL REVIEW

Provide a workman familiar with this project to accompany Architect/Engineer on final mechanical system review. Provide necessary tools, equipment ladders, etc. for access to systems. Final mechanical system review will not be made until:

1. The Testing and Balancing Report is in the hands of the Engineer.
2. Water Treatment Contractor letters are in the hands of the Engineer.
3. Filter replacement chart is in the hands of the Engineer.
4. Temperature Control system diagrams in frame are mounted.
5. Owner's equipment manual has been forwarded to the owner and engineer for review.

3.6 HVAC CLOSE-OUT PROCEDURES

1. As Built Drawings

   The Contractor shall furnish "as-built drawings" upon completion of the project contract and prior to final payment.

2. Commissioning

   a. The contractor shall perform commissioning activities with the owner. This shall include a manufacturer's service technician representative to start-up equipment and verify that it meets all manufacturer guidelines. The commissioning process will occur prior to substantial completion. At a minimum, the following will be a part of the commissioning:

      1. Starting equipment
      2. Balancing equipment (Refer to section 230593)
      3. Education of owner
      4. Organize training with Supervisor of Building Equipment and Grounds

   b. Operational training:

      Train:

      1. On-site engineer or custodian
      2. Minimum of two (2) maintenance personnel

   c. Maintenance training:

      1. Train:
         a. Minimum of two (2) maintenance personnel

3. Warranties: (Warranties specific to certain equipment are indicated in other sections of these specifications. The Warranties listed below are the minimum required).

   a. Minimum of one (1) year on total system (parts and labor).
   b. Minimum of five (5) years on packaged equipment A/C compressors (parts only).
   c. Minimum of ten (10) years on gas/heat exchanger equipment (parts only).
   d. Minimum of one (1) year on temperature controls (parts and labor).
   e. Mark on all equipment the warranty expiration date with permanent marker.
   f. Factory warranties shall not start until substantial completion of project.

4. Required Submittals

   a. Operation and maintenance manuals
   b. Equipment shop drawings.

c. Schedule of equipment warranties
d. Balancing report

END OF SECTION

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase and poly-phase, general-purpose, horizontal, small, and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.

B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 104 deg F and at altitude of 3680 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Re-greasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: One class below the insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Manufacturers standard enclosure materials.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
5. Provide with shaft grounding rings.

2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.

2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following hangers and supports for HVAC system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 23 Section "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."
3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. Empire Industries, Inc.
3. ERICO/Michigan Hanger Co.
4. Grinnell Corp.

C. Galvanized, Metallic Coatings: Pre-galvanized, hot dipped, or electro-galvanized.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Hanger Rods: Continuous-thread rod, nuts and washer made of carbon steel.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. Thomas & Betts Corporation.
4. Unistrut Corp.; Tyco International, Ltd.
5. Anvil

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.
7. Engineer pre-approved equal.

C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Masterset Fastening Systems, Inc.
d. MKT Fastening, LLC.
e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated or stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. B-Line Systems, Inc.; a division of Cooper Industries.
b. Empire Industries, Inc.
c. Hilti, Inc.
d. ITW Ramset/Red Head.
e. MKT Fastening, LLC.
f. Powers Fasteners.

2. Indoor Applications: Zinc-coated or stainless steel.
3. Outdoor Applications: Stainless steel.

2.7 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ERICO/Michigan Hanger Co.
b. MIRO Industries.

c. Anvil

2. Description: Single base unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
4. Hardware: Galvanized- or stainless steel.
5. Accessories: Protection pads.

C. Low-Type, Single-Base, Single-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. MIRO Industries.
   b. Anvil

2. Description: Single base with vertical and horizontal members, and pipe support, for roof installation without membrane protection.
3. Base: Single, vulcanized rubber, molded polypropylene, or polycarbonate.
4. Vertical Members: Two, galvanized- or stainless steel, continuous-thread rods.
5. Horizontal Member: Adjustable horizontal, galvanized- or stainless-steel pipe support channels.
6. Pipe Supports: Roller, Strut clamps, Clevis or Swivel hanger.
7. Hardware: Galvanized- or Stainless-steel.
8. Accessories: Protection pads.
9. Height: 12 inches.

D. High-Profile, Single-Base, Single-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.
   c. Portable Pipe Hangers.
   d. Anvil

2. Description: Single base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
3. Base: Single vulcanized rubber or molded polypropylene.
4. Vertical Members: Two, galvanized- or stainless steel, continuous-thread rods.
5. Horizontal Member: One, adjustable height, galvanized- or stainless-steel pipe support slotted channel or plate.
6. Pipe Supports: Roller, Clevis or Swivel hanger.
7. Hardware: Galvanized- or Stainless-steel.
8. Accessories: Protection pads.
9. Height: 36 inches.

E. High-Profile, Multiple-Pipe Stand:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Portable Pipe Hangers.
   b. Anvil

2. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
3. Bases: Two or more; vulcanized rubber or molded polypropylene.
4. Vertical Members: Two or more, galvanized- or stainless-steel channels.
5. Horizontal Members: One or more, adjustable height, galvanized- or stainless-steel pipe support.
6. Pipe Supports: Roller, Strut clamps, Clevis or Swivel hanger.
7. Hardware: Galvanized- or stainless-steel.
8. Accessories: Protection pads.
9. Height: 36 inches.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings or copper plated hangers on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
2. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
3. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
4. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
5. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
6. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

F. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

H. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.

9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

I. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

J. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

K. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

L. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.

2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation: (Must be coordinated with structural engineer)

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 07 Section "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

N. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length as long as protective shield or minimum of 4”.

O. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve minimum of 1" per 40' slope or as otherwise indicated.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Work Included:

1. Piping Insulation Including Valves and Fittings
2. Equipment Casings
3. Duct Exterior Insulation

SUBMITTALS

A. Product Data: Submit product data for the following as specified under Section 230500.

1. All Insulation

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Insulation (Fiberglass)

1. Knauf
2. Owens-Corning Fiberglass
3. Johns-Manville
4. Certainteed

B. Insulation (Foamed Plastic)

1. Armstrong Armaflex
2. Rubatex

2.2 PIPE INSULATION:

A. Piping: Insulate with Fiberglas SSL-11 ASJ pipe insulation with self-sealing lap. ASTM C547 Type I, Maximum K/inch = .29 at 200 deg. F. Piping insulation shall conform to the minimum insulation requirements as listed in Table A. Apply insulation with all sides

and end joints butted tightly. Seal ends of insulation with vapor barrier mastic at each fitting and at each joint.

Adhere ASJ jacket by removing release paper after the insulation is installed on pipe and sealing the lap starting in the center of each section working towards the ends. Adhesive must be pressured by rubbing with nylon sealing tool or other hard edge. Apply pressure sensitive adhesive coated butt strips in the same manner. NOTE: Minimum ambient temperature for this adhesive is 25 dg. F.

All insulation shall be continuous through wall and ceiling openings and sleeves. Insulation on all cold surfaces where vapor barrier jackets are used will be applied with a continuous, unbroken vapor seal. Hangers, supports, anchors, etc., which are secured directly to cold surfaces must be adequately insulated and vapor-sealed to prevent condensation. Crushing of insulation at hangers is not permitted and will require pipe saddles with high-density foam glass inserts. Pipe saddles shall be insulated as required to complete a continuous unbroken insulation of pipe as specified for the piping being supported. Specified adhesives mastics and coatings shall be applied at the manufacturer's recommended minimum coverage per gallon.

B. Fittings: All fittings, valves, flanges, shall be covered with PVC pre-molded one-piece fitting covers utilizing factory supplied hi-lo temperature insulation insert. Insulation insert shall be applied to the fitting with ends of insert tucked snugly into throat of fitting and edges adjacent to pipe. No gaps shall occur between fitting insulation and pipe insulation. Secure PVC pre-molded cover to insulated fitting by stapling and taping edges of cover with Zeston color matching Z-tap. Chilled and cold-water systems, fittings, valves, flanges, PVC pre-molded fitting cover shall be secured with Zeston Vapor Barrier Adhesive or Equal (Fosters 85-20). Circumferential edges of cover shall be wrapped with Zeston color matching Z-tape. The tape shall extend over adjacent pipe insulation and overlap itself at least 2” on the downward side.

C. Exposed pipe insulation shall be protected and receive an exterior heavy duty jacketing equal to CEEL-CO 300 series PVC jacketing.

2.3 REFRIGERANT PIPING INSULATION:

Armaflex or equivalent foamed plastic pipe insulation. Piping insulation shall conform to the minimum insulation requirements as listed in Table A. Paint exposed exterior insulation with ultraviolet protective coating.

TABLE A [a, b, c, d, e]
Minimum Pipe Insulation Thickness(in.)

Fluid Design Operating Temperature Range (°F)	**Insulation Conductivity**		**Nominal Pipe Diameter (in.)**				
	Conductivity Range BTU – in./ (h - ft² - °F)	**Mean Rating Temperature °F**	**Less than 1**	**1 to less than 1 ½**	**1 ½ to less than 4**	**4 to less than 8**	**8 & Up**
Heating Systems (Steam, Steam Condensate, and Hot Water)							
Above 350	0.32-0.34	250	4.5	5.0	5.0	5.0	5.0
251-350	0.29-0.32	200	3.0	4.0	4.5	4.5	4.5
201-250	0.27-0.30	150	2.5	2.5	2.5	3.0	3.0
141-200	0.25-0.29	125	1.5	1.5	2.0	2.0	2.0
105-140	0.22-0.28	100	1.0	1.0	1.5	1.5	1.5
Domestic and Service Hot Water, Condensing Water Systems							
105 and Greater	0.22-0.28	100	1.0	1.0	1.5	1.5	1.5
Cooling Systems (Domestic Cold Water, Condensate Drains, Roof Drains, Chilled Water, Brine, and Refrigerant)							
40-60	0.21-0.27	75	0.5	0.5	1.0	1.0	1.0
Below 40	0.20-0.26	50	0.5	1.0	1.0	1.0	1.5

[a] These thicknesses are based on energy efficiency considerations only. Additional insulation and vapor retarders are sometimes required relative to safety issues/surface temperature, and issues such as water vapor permeability or surface condensation.

[b] For Heating Systems and Domestic and Service Hot Water systems piping smaller than 1.5 in. and located in partitions within conditioned spaces, reduction of these thickness by 1 in. shall be permitted but not to thicknesses below 1 in.

[c] for direct-buried Heating and Domestic and Service Hot Water systems piping, reduction of these thicknesses by 1.5 in. shall be permitted but not to thickness below 1 in. For direct-buried cooling system piping, insulation is not required.

[d] the table is based on steel pipe. Nonmetallic pipes schedule 80 thickness or less shall use the table values. For other nonmetallic pipes having thermal resistance greater than that of steel pipe, reduced insulation thicknesses are permitted if documentation is provided showing that the pipe with the proposed insulation has no more heat transfer per foot/meter than a steel pipe of the same size with the insulation thickness shown in table.

[e] All above ground traps and waste piping that receives cooling coil condensate shall be insulated with minimum 0.5 in. thick pipe insulation.

2.4 OUTDOOR PIPE INSULATION:

Exterior exposed chilled water piping shall be insulated with 2” thick fiberglass pipe insulation. Insulation shall be covered with a protective .016 smooth sheet aluminum 3003 alloy jacket. Finish fittings with Foster Sealfast G-P-M-35-00 reinforced with Foster Mast-A-Fab. Attach with 3/8” inch wide, .015-inch thick aluminum bands. At contractors option, in lieu of aluminum jacket, Alumaguard rubberized bitumen membrane by Polyguard Products or equal with a minimum thickness of 56 mils may be used.

2.5 DUCT EXTERIOR INSULATION

DUCT SYSTEM	INSULATION
A. All Outside Air/Combustion Air	2” - .75 PCF (R-4.2)
B. All Concealed Round Supply	2” - .75 PCF (R-4.2)
C. Moisture Laden Exhaust (Dishwasher, Locker Rooms, Dryers, Etc.)	2” - .75 PCF (R-4.2)

All ducts, plenums, and casings for the above listed duct systems shall be insulated with fiberglass blanket type duct wrap with FSK facing. Insulation shall be cut slightly longer than the circumference of the duct to ensure full thickness. The insulation shall have an average thermal conductivity not to exceed a K factor of .27 at a mean temperature of 75 dg. F.

All insulation shall be applied with circumferential joints tightly butted and longitudinal joints overlapped a minimum of 2".

Adhere insulation with 4" strips of insulation bonding adhesive (Class I) at 8" o.c.

On circumferential joints the 2" flange of the facing shall be stapled with 9/16" flare door staples on 6" centers and taped with minimum 3" wide foil reinforced kraft tape. All pin penetrations or punctures in facing shall be taped to ensure complete vapor barrier.

Insulation shall be continuous through partitions, coils, etc. Insulate fire damper sleeves to partitions.

2.6 OUTDOOR DUCT INSULATION:

Exterior duct exposed to the weather to be insulated with minimum 2” thick foil-faced, rigid closed-cell polyisocyanurate foam sheathing board. Insulation on horizontal top surfaces shall be thicker and tapered at 1/4" per foot to allow for adequate water drainage. Board to be installed with 12 ga. cup head weld pins. All seams, joints, and pins to be sealed off with foil-faced, water-resistive tape to match facing. The rigid board to be jacketed with .020 stucco embossed aluminum jacket. Jacket to be screwed off and sealed watertight. At contractors option, in lieu of aluminum jacket, Alumaguard rubberized bitumen membrane by Polyguard Products or equal with a minimum thickness of 56 mils may be used.

PART 3 - EXECUTION

3.1 PREPARATION

All testing of ductwork and piping shall be completed, and all leaks repaired prior to application of insulation.

3.2 INSTALLATION

A. All insulation shall have composite (insulation, jacket or facing, and adhesive used to adhere the facing or jacket to the insulation) fire and smoke hazard ratings as tested by procedure ASTM E-84, NFPA 255 and Underwriters' Laboratories, Inc. Standard #723, not to exceed:

Flame Spread	25
Smoke Developed	50
Fuel Contributed	50

Accessories, such as adhesives, mastics, cements, tapes, and glass cloth for fittings shall have the same component ratings as listed above. All products or their shipping cartons shall bear a label indicating flame and smoke ratings in compliance with the listed ratings maximum. Any treatment of jackets or facings to impart flame and smoke-safety shall be permanent. The use of water-soluble treatments is prohibited. The Insulation Contractor shall certify, in writing, prior to installation, that all products to be used will meet the above criteria.

B. Edges of insulation shall be taped with joint sealing tape. The vapor barrier shall be secure at all times; no staples shall be used to close or secure jacket in these systems.

C. Adhesives, Sealers, Facings, and Vapor Barrier Coatings shall be compatible with materials to which applied, and shall not corrode, soften, or otherwise attack the pipe or insulation materials in either the wet or dry state. Use only adhesives, sealers, facings, and vapor barrier coatings recommended by the approval manufacturer of insulation materials.

D. Install materials in accordance with manufacturer’s instructions.

E. On exposed piping, locate insulation and cover seams in least visible locations.

F. Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:

1. Provide vapor barrier, factory applied, or field applied.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe.
3. Provide finish coating to type specified for insulation used.
4. PVC fitting covers shall be used with all service insulation jacket.
5. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.

6. Insulate entire system including fittings, valves, unions, flanges, trainers, flexible connections, and expansion joints.
7. Insulate and vapor seal hangers, supports, anchors, and other equipment attached directly to cold surfaces to prevent condensation.

G. For insulated pipes conveying fluids above ambient temperature:

1. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
2. Provide finish coating of type specified for insulation used.
3. PVC fitting covers shall be used with all service insulation jacket.
4. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
5. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

E. Inserts and Shields:

1. Application: Piping 1 inch diameter or larger.
2. Shields: Factory coated galvanized steel or aluminum between pipe hangers or pipe hanger rolls and inserts, ribbed with rolled edges for use with pipe hangers.
3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: same thickness and contour as adjoining insulation; length:

Nom. Pipe Size (inch)	Insert Length (inch)
½ to 2½	6
3 to 6	9
8 to 10	12
12 and over	18

5. Insert Material: ASTM C640 cork, hydrous calcium silicate insulation, or other heavy density insulating material suitable for the planned temperature range.

F. Finish insulation at supports, protrusions, and interruptions.

H. Do not insulate over name plate or ASME stamps. Bevel and seal insulation around such.

I. Install insulation for equipment requiring access for maintenance, repair, or cleaning, in such a manner that it can be easily removed and replaced without damage.

END OF SECTION

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Mechanical sleeve seals.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure within Buildings: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2 psig and is reduced to secondary pressure of 0.5 psig or less.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Piping specialties.
2. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
3. Pressure regulators. Indicate pressure ratings and capacities.
4. Dielectric fittings.
5. Mechanical sleeve seals.
6. Escutcheons.

B. Welding certificates.

C. Field quality-control reports.

D. Operation and Maintenance Data: For pressure regulators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of authorities having jurisdiction.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating and protect from direct sunlight.

1.8 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

1.9 COORDINATION

A. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified:

1. Steel Piping:

Pipe	Fittings
1. Sawhill	1. Grinnell
2. LaClede	2. Stockman
3. Texas Pipe	3. Ward

B. Natural Gas Piping, Above Grade:

1. Steel Pipe up to and including 2-inches: ASTM A53, Schedule 40 black, Type E Grade B, or Type S Grade B.

   a. Fittings: ASME B16.11, 2000 psi forged steel, welded or threaded type; Class 150 black malleable iron, threaded, ASME B16.3.
   b. Joints: NFPA 54, threaded or welded to ANSI B31.2, ANSI B31.8.
   c. Couplings: ASME B16.11, forged steel, 3000 psi, threaded or welded; Class 150 black malleable iron, threaded, ASME B16.3.

2. Steel Pipe Over 2-inches: ASTM A53, schedule 40, black, Type E Grade B, or Type S Grade B.

   a. Fittings: ASME B16.9, steel, butt-welding type, wall thickness to match pipe.
   b. Joints: ANSI B31.2, ANSI B31.8, welded.
   c. Flanges: Class 150 forged black steel, slip-on or weldneck, raised face, ASME B16.5. Use flat-faced flanges for connection to Class 125 flat-faced cast iron flanges, fittings, or valves.
   d. Gaskets: Non-metallic, self-centering or full face, ASME B16.21.
   e. Flange Bolting: Carbon steel, coarse thread, ASTM A307 Grade B, ASME B18.2.1; Heavy hex nuts, ASTM A563 Grade C, D, DH, DH3, ASME B18.2.2.
   f. Flange Insulation: Insulating gasket, bolt tubes, insulating washers, steel washers; Electrically isolate underground piping from aboveground piping.

2.2 NATURAL GAS PIPING, VALVES AND ACCESSORIES

A. Plug Valves:

1. Up to and including 2-inches: 175 or 200 psi WOG, iron body, lubricated plug, threaded ends, wrench operator with stops.
2. Larger than 2-inches: 175 or 200 psi WOG, iron body, 125 psi flanged ends, bolted cover, lubricated plug, wrench operator with stops to 4-inch size, open gear operator with stops for 6-inch size and larger.

B. Gas Cock: 125 psi WOG, iron body, permanently lubricated with corrosion resistant plug and bearings, suitable seals for intended service, threaded ends, wrench operator.

C. Gauge Cock: 3000 psi WOG, carbon steel, barstock needle valve.

D. Unions: Unions: Forged steel, 3000 psi SWP, threaded, bronze to steel seat; Class 150 black malleable iron. Use dielectric insulating unions to electrically isolate underground piping from aboveground piping.

2.3 PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller; flanged for regulators NPS 2-1/2 and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Actaris.
    b. American Meter Company.
    c. Eclipse Combustion, Inc.
    d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
    e. Invensys.
    f. Maxitrol Company.
    g. Richards Industries; Jordan Valve Div.

2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.

6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig.

C. Appliance Pressure Regulators: Comply with ANSI Z21.18.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

    a. Canadian Meter Company Inc.
    b. Eaton Corporation; Controls Div.
    c. Harper Wyman Co.
    d. Maxitrol Company.
    e. SCP, Inc.

2. Body and Diaphragm Case: Die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber.
6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
7. Factory-Applied Finish: Minimum three-layer polyester and polyurethane paint finish.
8. Regulator may include vent limiting device, instead of vent connection, if approved by authorities having jurisdiction.
9. Maximum Inlet Pressure: 2 psig.

2.4 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

2.5 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico Inc.
    c. Metraflex Company (The).

d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
3. Pressure Plates: Carbon or Stainless steel.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating or stainless steel of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.6 ESCUTCHEONS

A. General Requirements for Escutcheons: Manufactured wall and ceiling escutcheons and floor plates, with ID to fit around pipe or tube, and OD that completely covers opening.

B. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Escutcheons: With set screw.

1. Finish: Polished chrome plated.

D. Split-Casting, Cast-Brass Escutcheons: With concealed hinge and set screw.

1. Finish: Polished chrome plated.

E. One-Piece, Stamped-Steel Escutcheons: With set screw or spring clips and chrome-plated finish.

F. Split-Plate, Stamped-Steel Escutcheons: With concealed hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Escutcheons: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Escutcheons: Cast brass with concealed hinge and set screw.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 and the International Fuel Gas Code to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 and the International Fuel Gas Code requirements for prevention of accidental ignition.

3.3 OUTDOOR PIPING INSTALLATION

A. Comply with NFPA 54, and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Install fittings for changes in direction and branch connections.

C. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

D. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 and the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install escutcheons at penetrations of interior walls, ceilings, and floors.

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
c. Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
d. Piping in Unfinished Service Spaces: One-piece, stamped-steel type with set screw or spring clips.
e. Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.
f. Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

K. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

L. Verify final equipment locations for roughing-in.

M. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

N. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

P. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

Q. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to

outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.

    a. Exception: Tubing passing through partitions or walls does not require striker barriers.

5. Prohibited Locations:

    a. Do not install natural-gas piping in or through circulating air ducts, clothes or trash chutes, chimneys, or gas vents (flues), ventilating ducts, or dumbwaiter or elevator shafts.
    b. Do not install natural-gas piping in solid walls or partitions.

R. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

S. Connect branch piping from top or side of horizontal piping.

T. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

U. Do not use natural-gas piping as grounding electrode.

3.5 VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance.

B. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing

3.6 PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Flanged Joints: Install gasket material, size, type, and thickness appropriate for natural-gas service. Install gasket concentrically positioned.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
4. NPS 2-1/2 to NPS 3-1/2: Maximum span, 10 feet; minimum rod size, 1/2 inch.

3.8 CONNECTIONS

A. Install piping adjacent to appliances to allow service and maintenance of appliances.

B. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

C. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.9 LABELING AND IDENTIFYING

A. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for piping and valve identification.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to NFPA 54, the International Fuel Gas Code and authorities having jurisdiction.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Refrigerant pipes and fittings.
2. Refrigerant piping valves and specialties.
3. Refrigerants.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of valve, refrigerant piping, and piping specialty.

1. Include pressure drop, based on manufacturer's test data, for the following:

a. Thermostatic expansion valves.
b. Solenoid valves.
c. Hot-gas bypass valves.
d. Filter dryers.
e. Strainers.
f. Pressure-regulating valves.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.7 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.8 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-134a:

1. Suction Lines for Air-Conditioning Applications: 115 psig.
2. Suction Lines for Heat-Pump Applications: 225 psig.
3. Hot-Gas and Liquid Lines: 225 psig.

B. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Suction Lines for Heat-Pump Applications: 535 psig.
3. Hot-Gas and Liquid Lines: 535 psig.

2.2 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L (ASTM B 280, Type ACR).

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8/A5.8M.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.3 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by a National Recognized Testing Laboratory (NRTL).

1. Body and Bonnet: Plated steel.
2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.

5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

F. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

G. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 700 psig.

H. Hot-Gas Bypass Valves: Comply with UL 429; listed and labeled by an NRTL.

1. Body, Bonnet, and Seal Cap: Ductile iron or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
5. Seat: Polytetrafluoroethylene.
6. Equalizer: Internal or External.
7. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 24-V ac coil.
8. End Connections: Socket.
9. Throttling Range: Maximum 5 psig.
10. Working Pressure Rating: 500 psig.
11. Maximum Operating Temperature: 240 deg F.

I. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

J. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

K. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

L. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

M. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina or charcoal.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

N. Mufflers:

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

O. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

P. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.4 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-134a: Tetrafluoroethane.

C. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-134a

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Suction Lines NPS 2 to NPS 4 for Conventional Air-Conditioning Applications: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with brazed soldered joints.

C. Hot-Gas and Liquid Lines**,** and Suction Lines for Heat-Pump Applications:

1. NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
2. NPS 2 to NPS 4: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with brazed joints.

D. Safety-Relief-Valve Discharge Piping:
1. NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
2. NPS 2 to NPS 4: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with brazed joints.

3.2 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Suction Lines NPS 2 to NPS 4 for Conventional Air-Conditioning Applications: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with brazed joints.

C. Hot-Gas and Liquid Lines, and Suction Lines for Heat-Pump Applications:

1. NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
2. NPS 2 to NPS 4: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with brazed joints.

D. Safety-Relief-Valve Discharge Piping:

1. NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
2. NPS 2 to NPS 4: Copper, Type L, drawn-temper tubing, and wrought-copper fittings with brazed joints.

3.3 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve, and in the suction line at the compressor.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.4 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

Q. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

R. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

S. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

T. Seal pipe penetrations through exterior walls according to Division 07 Section "Joint Sealants" for materials and methods.

U. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

3.5 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.6 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.
9. NPS 4: Maximum span, 12 feet; minimum rod size, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.8 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging. Coordinate exact requirements with equipment manufacturer and install per the most stringent requirements.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig or as otherwise required by equipment manufacturer.
4. Charge system with a new filter-dryer core in charging line.

3.9 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall ducts and fittings.
2. Duct liner.
3. Sealants and gaskets.
4. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2019.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Factory-fabricated ducts and fittings.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

D. Welding certificates.

E. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2019, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2019, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL DUCTS AND FITTINGS: (Low pressure – static pressure in duct less than or equal to 2 inches W.G. and velocities less than 2400 FPM).

A. Rectangular Ductwork: Galvanized steel lock-forming quality, having a zinc coating of 1.25 ounces per square foot for each side (coating class G90).

B. Round Ductwork and Fittings: Galvanized steel spiral construction. Duct quality and gauges shall not be less than that for straight duct. Elbows shall be 4-piece adjustable seam type with a radius of not less than (1) times width of duct on centerline. Mitered elbows where noted on drawings. Lateral, conical and wye fittings as shown on the drawings.

C. Round Ductwork and Fittings (Concealed): Galvanized steel construction with spiral or snap-lock seams. Duct quality and gauges shall not be less than that for straight duct. Elbows shall be 4-piece adjustable seam type with a radius of not less than (1) times width of duct on centerline. Mitered elbows where noted on drawings. Tees and fittings shall be made by conical or lateral saddle taps. Mechanical attachments shall be sufficient to maintain the integrity of the assembly and properly sealed.

D. Round Ductwork and Fittings (Exposed): Mil Phosphatized steel spiral construction. Duct quality and gauges shall not be less than that for straight duct. Elbows shall be 1-piece smooth radius type. Elbow shall have a radius of not less than (1½) times width of duct on centerline. Mitered elbows where noted on drawings. Lateral, conical and wye fittings as shown on the drawings. Saddle taps are not allowed.

E. Exposed Ductwork: All exposed ductwork shall be mill phosphatized metal. Finish of all exposed ductwork shall be suitable for painting by the General Contractor.

2.2 DUCT LINER

A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Subject to compliance with requirements, provide products by one of the following:

    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Knauf Insulation.
    d. Owens Corning.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Solvent or Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel, aluminum or stainless steel with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted edge overlapping.

5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
7. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:

    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.

8. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.3 SEALANT AND GASKETS

TABLE A
Minimum Duct Seal Level[a]

	Duct Type			
	Supply			
Duct Location	**Less than or equal to 2 in. w.c.** [b]	**Greater than 2 in. w.c.** [b]	**Exhaust**	**Return**
Outdoors	A	A	C	A
Unconditioned Spaces	B	A	C	B
Conditioned Spaces[c]	C	B	B	C

[a] See Table B for definition of Seal Level.
[b] Duct design static pressure classification.
[c] Includes indirectly conditioned spaces such as return air plenums.

TABLE B
Duct Seal Levels

Seal Level	**Sealing Requirements**[a]
A	All transverse joints, longitudinal seams, and duct wall penetrations. Pressure-sensitive tape shall not be used as the primary sealant.
B	All transverse joints and longitudinal seams. Pressure-sensitive tape shall not be used as the primary sealant.
C	Transverse joints only.

Longitudinal seams are joints oriented in the direction of airflow. Transverse joints are connections of two duct sections oriented perpendicular to airflow. Duct wall penetrations are openings made by any screw fastener, pipe, rod, or wire. Spiral lock seams in round and flat oval duct need not be sealed. All other

connections are considered transverse joints, including but not limited to spinins, taps, and other branch connections, access door frames and jambs, duct connections to equipment, etc.

2.4 DUCT SEAL SYSTEMS

A. Low pressure ductwork – static pressure in duct less than or equal to 2 inches W.G. and velocities less than 2400 FPM.

All low-pressure ductwork shall be sealed with Design Polymetrics DP 1010 water-based, zero VOC's duct sealant or Hardcast Foil-Grip 1402 as manufactured by Carlisle Coating and Waterproofing, Inc. Engineer pre-approved equals.

B. Medium pressure ductwork - static pressure in duct greater than 2" W.G. and velocities greater than 2400 FPM.

All medium pressure ductwork shall be sealed with Design Polymetrics DP 1010 water-based, zero VOC's duct sealant or Hardcast Foil-Grip 1402 as manufactured by Carlisle Coating and Waterproofing, Inc. Engineer pre-approved equals.

C. Install duct sealing system per manufacturer's installation instructions. Install in a neat workmanlike manner.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

2.6 SPECIALTY DUCTWORK

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. General: Fabricate and install ductwork so no undue vibration or noise results. Make all joints airtight with additional caulking provided if necessary.

Includes sheet metal work as required for complete air distribution systems including ducts, housing, louvers, grilles, dampers, access doors, etc. Joints and seams shall be made airtight by use of mastic, sealant or gaskets for all pressures that may occur.

All ductwork shall be rigidly constructed and installed. Construction and bracing of ducts shall conform to the recommended practices as published by A.S.H.R.A.E., S.M.A.C.N.A. and the International Mechanical Code. The most stringent document shall be the guiding standard. Duct sizes 19” to 60” wide and larger which have more than 10 square feet of unbraced panel shall be cross-broken. Beaded duct shall only be allowed if approved by the local building inspector. Neither beads nor cross breaks affect reinforcement spacing. Negative pressure duct shall be cross broken for inward deflection.

All slip joints shall be in the direction of the flow.

Ducts shall be constructed of weights as listed below:

Sizes	Gauge	Joints	Bracing
0"-12"	26	Drive Slip, Plain 'S' Slip	None
13"-18"	24	Drive Slip, Plain 'S' Slip	None
19"-30"	24	Hemmed 'S' Slip, 1" Bar Slip	1" x 1" x 1/8” Angle
31"-42"	22	1" Bar Slip, Reinforced Bar Slip	1" x 1" x 1/8" Angle
43"-54"	22	1½ " Bar Slip, Reinforced Bar Slip	1½” x 1½” x 1/8" Angle
55"-60"	20	1½” Bar Slip, Reinforced Bar Slip	1½” x 1½” x 1/8" Angle
61"-84"	20	Reinforced Bar Slip, Angle Slip	1½” x 1½” x 1/8" Angle
85"-96"	18	Companion Angle, Angle Slip	1½” x 1½” x 3/16" Angle
Over 96"	18	Companion Angle, Angle Slip	2" x 2" x 1/4” Angle

Rectangular ducts shall be made with standing seams and braced with angle as required. Turning vanes shall be used for all changes in direction. All ducts shall be supported on a maximum of 5'0" centers properly hung from straps or rods and secured in a neat and workmanlike manner. Seal all joints for airtight installation. Screw or rivet all round duct joint connections.

All duct sizes as indicated on the drawings are inside clear dimensions (overall outside dimension shall be increased to accommodate duct liner. Any changes in duct sizes shall be requested from the Engineer, and if it becomes necessary to change the size or shape of any duct, the equivalent area shall be maintained. Where deviations from the drawings are made, as built drawings shall be forwarded to the Engineer prior to final acceptance.

Use 45-degree high efficiency take-off fittings for round ductwork. Install damper with locking quadrant at branch take-off to diffuser. Provide damper rod extension and ceiling flange where dampers are concealed and inaccessible. If damper is specified with diffuser - no takeoff damper required.

Generally, duct transitions are made on bottom of ducts. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Maximum divergence upstream of equipment to be 30 degrees and 45 degrees convergence downstream.

All ductwork located in exposed areas shall be mounted as high as possible.

3.2 FLEXIBLE DUCT CONNECTIONS

A. Duct connections to each air moving device with fan motors ½ HP and larger shall be made with UL listed neoprene - coated flameproof fabric. Flexible connection shall be minimum 2" wide and directly secured to joining ductwork and equipment with galvanized steel collar frames. All connections shall be made completely airtight in an approved manner without the use of staples.

B. Flexible connections to be installed in such a manner to isolate transmission of sound and vibration from prime equipment to the associated duct connected systems.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

C. Hanger Spacing: Comply with these specifications, or if not specified reference SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection. ***Contractors option*** to utilize cable style support systems provided manufacturer and specific cable system has been pre-approved by engineer prior to bidding.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 12 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 DUCT CLEANLINESS

A. Comply with SMACNA's "Duct Cleanliness for new Construction Guidelines," according to advanced level of cleanliness and SMACNA’s “IAQ Guideline for Occupied Buildings Under Construction, 2007-Chapter 3.

B. The following items are mandatory:
   1. Ductwork shall be sealed when transported to the construction site.
   2. Ductwork shall be stored in clean, dry conditions and be kept sealed while stored.
   3. All internal surfaces of ductwork shall be wiped down immediately prior to installation for removal of dust.
   4. All open ends of ductwork shall be sealed on completed ductwork and any overnight work-in-progress.
   5. During installation, protect ductwork, waiting to be installed with surface wrapping, etc.
   6. During construction, seal HVAC supply and return openings to protect them from construction dust infiltration.
   7. Include erosion and sedimentation control measures to minimize site dust during occupied renovations.

3.8 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated:

B. Liner: 1" thick, 1.5 pcf acoustical liner with a minimum R-value = 4.2 on all rectangular supply and return ducts.

END OF SECTION

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Manual volume dampers.
2. Control dampers.
3. Turning vanes.
4. Duct-mounted access doors.
5. Flexible ducts.
6. Duct accessory hardware.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances, and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Wiring Diagrams: For power, signal, and control wiring.

C. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

1.5 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ruskin
2. Nailor
3. Price
4. Greenheck
5. Pottorff

B. Balancing Dampers: Balancing dampers shall be provided for each supply, return, and exhaust grille and diffuser as indicated on the schedule or as shown on the plans.

Manual volume balancing dampers shall be locking quadrant type and built-in accordance to SMACNA standards for low-pressure duct systems. Blades and frames shall be galvanized steel construction with molded synthetic bearings. Dampers shall be single or opposed blade type.

Ruskin Model MD25 (rectangular duct - up to 36" W x 12" H).
Ruskin Model MD35 (rectangular duct - up to 48" W x 48" H).
Ruskin Model MDRS25 (round duct - up to 20" dia.).

2.3 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ruskin
2. Nailor
3. Price
4. Greenheck
5. Pottorff

B. Automatic dampers, where not furnished under Temperature Control Section shall be equal to Ruskin Model CD36 or approved equal. Outside air, low leakage type dampers, shall be equal to Ruskin Model CD50 or approved equal.

C. Frames:

1. Hat shaped.
2. Galvanized-steel channels, 16 gage thick.
3. Mitered and welded corners.

D. Blades:

1. Multiple blade with maximum blade width of 8 inches. Parallel-blade design.
2. Galvanized steel.
3. 16 gage thick.
4. Blade Edging: Closed-cell neoprene edging.

E. Blade Axles: 1/2-inch- diameter; plated steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus -40 to plus 200 deg F.

2.4 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
6. Hercules

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall.

2.5 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Flexmaster U.S.A., Inc.
5. Greenheck Fan Corporation.
6. McGill AirFlow LLC.
7. Nailor Industries Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Ventfabrics, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Vision panel.
d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.

2.6 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Thermaflex Type M-KE
4. Atco

B. Insulated, Flexible Duct: UL 181, Class 1, CPE core supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 5000 fpm.
3. Temperature Range: Minus 20 to plus 250 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1-2004.

C. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.

2.7 DUCT ACCESSORY HARDWARE

A. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel ducts.

C. Install volume dampers at points on supply and return systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install fire and fire/smoke dampers according to UL listing.

F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be outward operating for access doors installed upstream from dampers and inward operating for access doors installed downstream from dampers.
2. Elsewhere as indicated.

G. Install access doors with swing against duct static pressure.

H. Access Door Sizes:

1. Two-Hand Access: 12 by 12 inches.

I. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

J. Connect flexible ducts to metal ducts with draw bands.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
   Inspect turning vanes for proper and secure installation.
4. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Centrifugal roof ventilators.
2. Ceiling-mounting ventilators.
3. Propeller fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual project site elevation = 1,158 ft.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

1.7 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set for each belt-driven unit.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Loren Cook Company.
2. Greenheck.
3. Twin City Fan Company.

4. Penn Ventilation.

B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.

C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains and grease collector where noted on plans.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.

E. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:

1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
4. Fan and motor isolated from exhaust airstream.

F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Refer to architectural plans and details.
2. Overall Height: Min. 12 inches or as required to suite project conditions.
3. Pitch Mounting: Manufacture curb for roof slope.
4. Metal Liner: Galvanized steel.

G. Capacities and Characteristics: Refer to schedules on plans.

2.2 CEILING-MOUNTING VENTILATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Loren Cook Company.
2. Greenheck.
3. Twin City Fan Company
4. Penn Ventilation.

B. Description: Centrifugal fans designed for installing in ceiling or for concealed in-line applications.

C. Housing: Steel, lined with acoustical insulation.

D. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.

E. Grille: Plastic [Aluminum], louvered grille with flange on intake and thumbscrew attachment to fan housing.

F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

G. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Ceiling Radiation Damper (where required): Fire-rated assembly with ceramic blanket, stainless-steel springs, and fusible link.
3. Isolation: Rubber-in-shear vibration isolators.
4. Manufacturer's standard wall cap, and transition fittings or roof cap as noted on plans.

H. Capacities and Characteristics: Refer to schedules on plans.

2.3 IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Loren Cook Company.
2. Greenheck.
3. Twin City Fan Company
4. Penn Ventilation.

B. Description: In-line, direct- or belt-driven centrifugal fans consisting of housing, wheel, outlet guide vanes, fan shaft, bearings, motor and disconnect switch, drive assembly, mounting brackets, and accessories.

C. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.

D. Direct-Driven Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing

E. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.

F. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

G. Capacities and Characteristics: Refer to schedules on plans.

2.4 PROPELLER FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Loren Cook Company.
2. Greenheck.
3. Twin City Fan Company
4. Penn Ventilation.

B. Description: Direct- or belt-driven propeller fans consisting of fan blades, hub, housing, orifice ring, motor, drive assembly, and accessories.

C. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

D. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.

E. Fan Wheel: Replaceable, **extruded**-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

F. Belt-Driven Drive Assembly: Resiliently mounted to housing, statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

1. Service Factor Based on Fan Motor Size: 1.4.
2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
3. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings with ABMA 9, L_{50} of 200,000 hours. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
4. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
5. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
6. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories:

1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
3. Wall Sleeve: Galvanized steel to match fan and accessory size.
4. Weathershield Hood: Galvanized steel to match fan and accessory size.
5. Weathershield Front Guard: Galvanized steel with expanded metal screen.
6. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.

H. Capacities and Characteristics: Refer to schedules on plans.

2.5 MOTORS

A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2.6 SOURCE QUALITY CONTROL

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Support floor-mounting units using elastomeric mounts or restrained spring isolators.

C. Install floor-mounting units on concrete bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

D. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.

E. Ceiling Units: Suspend units from structure; use steel rods.

F. Support suspended units with elastomeric or spring hangers.

G. Install units with clearances for service and maintenance.

H. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor, and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Refer to Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Diffusers, Registers, and grilles

B. Related Sections:

1. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 DIFFUSERS, REGISTERS, AND GRILLES

A. Provide diffusers, registers, and grilles as scheduled on the drawings. All model numbers are based on Titus unless otherwise noted.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Titus.
b. Krueger.
c. Carnes.
d. Nailor Industries Inc.
e. Price Industries.
f. Greenheck.

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, fire dampers, etc.

D. Round runouts to individual diffusers, not indicated on the drawings, shall be sized according to the following schedule. Rectangular runouts shall be as shown in the drawings.

DIFFUSER RUNOUT SCHEDULE:

Diffuser CFM	Runout Size
0-100	6” Round
101-150	7” Round
151-200	8” Round
201-275	9” Round
276–400	10” Round
401-600	12” Round

E. All grilles, registers, and diffusers are to be white, or match ceiling color indicated on architectural drawings and schedules or as otherwise indicated.

F. All grilles, registers, and diffusers shall be provided with mounting frames and accessories compatible with ceiling, wall, and floor surface type indicated on architectural drawings and schedules or as otherwise indicated.

G. All lay-in mounted diffusers shall be provided to fit in ceiling grid module.

H. All ceiling supply diffusers are 4-way throw unless indicated by throw arrows on drawings.

I. All grilles are to be constructed of steel, except in damp or corrosive areas such as locker rooms, toilet rooms, etc. All aluminum grilles are to be installed in these areas.

J. Provide necessary rectangular to round adapters at diffuser/grille connection.

K. All surfaces visible from face of grille/diffusers are to be painted flat black.

L. Check location of outlets and make necessary adjustments in position to conform with architectural features, ceiling grid, symmetry, and lighting arrangement.

M. Base air outlet application on space noise level of NC 25 maximum.

N. Exhaust and return grilles are to be installed so that line of sight is to the flat side of curved or angled blades, and not looking into grilles.

O. Provide opposed blade dampers in neck of diffusers in locations where manual volume dampers are not accessible at branch take-off.

P. All grilles, registers, and diffusers located in fire rated ceilings shall be constructed of minimum 26 ga. steel and shall have radiation fire dampers installed.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

SECTION 235400 - FURNACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Gas-fired, condensing furnaces and accessories complete with controls.
2. Air filters.
3. Refrigeration components.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each of the following:

1. Furnace.
2. Thermostat.
3. Air filter.
4. Refrigeration components.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For each furnace to include in emergency, operation, and maintenance manuals for each of the following:

1. Furnace and accessories complete with controls.
2. Air filter.
3. Refrigeration components.

D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2019, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2019 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2010, Section 6 - "Heating, Ventilating, and Air-Conditioning."

D. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:

1. Warranty Period, Commencing on Date of Substantial Completion:

a. Furnace Heat Exchanger: 20 years.
b. Integrated Ignition and Blower Control Circuit Board: One year.
c. Draft-Inducer Motor: One year.
d. Refrigeration Compressors: Five years.
e. Evaporator and Condenser Coils: One year.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Disposable Air Filters: Furnish two complete sets.

PART 2 - PRODUCTS

2.1 GAS-FIRED FURNACES, CONDENSING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Trane.
2. Carrier Corporation
3. Lennox
4. York
5. Engineer pre-approved equal

B. General Requirements for Gas-Fired, Condensing Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3, "Gas-Fired Central Furnaces," and with NFPA 54.

C. Cabinet: Steel or Galvanized steel.

1. Cabinet interior around heat exchanger shall be factory-installed insulation.
2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
3. Factory paint external cabinets in manufacturer's standard color.
4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2019.

D. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.

1. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Special Motor Features: Multi-tapped, multi-speed with internal thermal protection and permanent lubrication.

E. Type of Gas: Natural.

F. Heat Exchanger:

1. Primary: Aluminized steel.
2. Secondary: Stainless steel.

G. Burner:

1. Gas Valve: 100 percent safety main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.

H. Gas-Burner Safety Controls:

1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.

2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.

I. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings pre-purges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.

J. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.

K. Accessories:

1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through roof.
2. CPVC Plastic Vent Materials.

    a. CPVC Plastic Pipe: Schedule 40, complying with ASTM F 441/F 441M.
    b. CPVC Plastic Fittings: Schedule 40, complying with ASTM F 438, socket type.
    c. CPVC Solvent Cement: ASTM F 493.

3. PVC Plastic Vent Materials:

    a. PVC Plastic Pipe: Schedule 40, complying with ASTM D 1785.
    b. PVC Plastic Fittings: Schedule 40, complying with ASTM D 2466, socket type.
    c. PVC Solvent Cement: ASTM D 2564.

L. Capacities and Characteristics: See schedule on plans.

2.2 THERMOSTATS

A. Solid-State Thermostat: Wall-mounting, 7 day programmable, microprocessor-based unit with automatic and manual switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, vacation mode, and battery backup protection against power failure for program settings. Thermostat to accommodate heating and cooling stages of specified and provided equipment.

B. Control Wiring: Unshielded twisted-pair cabling.

1. No. 24 AWG, 100-ohm, four pair.
2. Cable Jacket Color: N/A.

C. Controls shall comply with requirements in ASHRAE/IESNA 90.1-2019, "Controls."

2.3 AIR FILTERS

A. Disposable Filters: 1-inch-thick pleated media with ASHRAE 52.2 MERV rating of 13 or higher, in sheet metal frame. Refer to details on plans for additional information.

2.4 REFRIGERATION COMPONENTS

A. General Refrigeration Component Requirements:

1. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
2. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IESNA 90.1-2010, "Energy Standard for Buildings except Low-Rise Residential Buildings."

B. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with AHRI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment." Match size with furnace. Include condensate drain pan with accessible drain outlet complying with ASHRAE 62.1-2019.

1. Refrigerant Coil Enclosure: Steel, matching furnace, and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and high-grade, heat resistant, corrosion free polymer material drain pan with ¾" primary and secondary drain

C. Refrigerant Line Kits: Annealed-copper suction and liquid lines factory cleaned, dried, pressurized with nitrogen, sealed, and with suction line insulated. Provide in standard lengths for installation without joints, except at equipment connections.

1. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I, 1/2-inch-thick minimum – comply with requirements in Division 23 section "230700 – HVAC Insulation".

D. Refrigerant Piping: Comply with requirements in Division 23 Section "232300 - Refrigerant Piping."

E. Air-Cooled, Compressor-Condenser Unit:

1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing. Provide with louvered coil guards.
2. Compressor: Hermetically sealed scroll type.

    a. Crankcase heater.
    b. Vibration isolation mounts for compressor.
    c. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
    d. Two-speed compressor motors shall have manual-reset high-pressure switch and automatic-reset low-pressure switch.
    e. Refrigerant Charge: R-410A.

3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with liquid subcooler.
4. Fan: Aluminum-propeller type, directly connected to motor.
5. Motor: Permanently lubricated, with integral thermal-overload protection.
6. Low Ambient Kit: Permits operation down to 0 deg F.
7. Mounting Base: Polyethylene.

F. Capacities and Characteristics: Refer to schedule on plans.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.

C. Examine roughing-in for gas and refrigerant piping systems to verify actual locations of piping connections before equipment installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.

B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.

C. Controls: Install thermostats at a mounting height of 48 inches (ADA) above floor.

D. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

E. Install ground-mounted, compressor-condenser components on 4-inch- thick, reinforced concrete base; 6 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

F. Install roof-mounted, compressor-condenser components on equipment supports specified in Division 07 Section "Roof Accessories". If equipment supports are not specified in Division 07, support as detailed on drawings.

3.3 CONNECTIONS

A. Gas piping installation requirements are specified in Division 23 Section "Facility Natural-Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

    a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
    b. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
    c. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
    d. Requirements for Low-Emitting Materials:

        1) Use CPVC solvent cement that has a VOC content of 490 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
        2) Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
        3) Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

4. Slope pipe vent back to furnace or to outside terminal.

D. Connect ducts to furnace with flexible connector. Comply with requirements in Division 23 Section "Air Duct Accessories."

E. Connect refrigerant tubing kits to refrigerant coil in furnace and to air-cooled, compressor-condenser unit.

1. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Comply with requirements in Division 23 Section "Refrigerant Piping" for installation and joint construction of refrigerant piping.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Perform electrical test and visual and mechanical inspection.
2. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks, replace lost refrigerant and oil, and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.

5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.5 STARTUP SERVICE

A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for physical damage to unit casings.
2. Verify that access doors move freely and are weathertight.
3. Clean units and inspect for construction debris.
4. Verify that all bolts and screws are tight.
5. Adjust vibration isolation and flexible connections.
6. Verify that controls are connected and operational.

B. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.

C. Measure and record airflows.

D. Verify proper operation of capacity control device.

E. After startup and performance test, lubricate bearings.

3.6 ADJUSTING

A. Adjust initial temperature and humidity set points.

B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.7 CLEANING

A. After completing installation, clean furnaces internally according to manufacturer's written instructions.

B. Install new filters in each furnace within 14 days after Substantial Completion.

END OF SECTION

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 GENERAL CONDITIONS:

A. The General Conditions, Supplementary General Conditions, General Requirements, and Special Conditions shall be and are hereby made a part of this Section of the specifications.

B. In case of conflicts between the electrical drawings and Division 26 of these specifications, the more stringent requirements shall govern. In all cases, notify the Engineer for direction.

C. The requirements of SECTION 26 05 00 - BASIC METHODS AND REQUIREMENTS establish minimum requirements, apply to, and are hereby made a part of all sections of Division 26 of this specification.

D. The Contractor shall be responsible for excavation of all earth, soil, and rock conditions at the site. Review the elevations and soil boring logs and include all associated costs.

E. Unless noted otherwise on the Drawings, or elsewhere in Division 26 Specifications, the singular words 'Provide', 'Furnish', or 'Install' noted on the drawings or in these Specifications shall mean to completely furnish, install, and connect each item, and if such is a part or component of a system the entire system shall be functional with all items and components provided. Unless noted otherwise on the Drawings, or elsewhere in Division 26 Specifications, any reference to 'wiring' noted on the drawings or in these Specifications shall mean both raceways and conductors or cables.

1.2 DESCRIPTION:

A. The electrical work shall include all labor, materials, tools, transportation, equipment, services and facilities, required for the complete, proper and substantial installation of all electrical work shown on the plans, and/or outlined in these specifications. The installation shall include all materials, appliances, and apparatus not specifically mentioned herein or noted on the drawings but which are necessary to make a complete working installation of all electrical systems.

B. All of the electrical related work required for this project (unless specified otherwise) is a part of the Electrical Contract price but is not necessarily specified under this division of the specifications or shown on the electrical drawings. Therefore, all divisions of the specifications and all drawings shall be consulted.

C. The floor plan drawings are schematic only and are not intended to show the exact routing of raceway systems between devices, lighting, and equipment unless dimensions are noted on the drawings. Routing of raceways overhead or below floor shall be as shown on the drawings, unless approved otherwise by the Engineer. Final routing of raceway systems between devices, lighting, and equipment will be governed by field conditions (structural members, mechanical equipment, ductwork, etc.) and shall be determined by the Contractor and approved by the Architect. Any changes in routing shall not change the design of the raceway system.

D. The floor plan drawings showing device and equipment locations are schematic only and are not intended to show exact locations unless dimensions are noted on the drawings. The Contractor shall review all contract drawings that may affect the location of devices and equipment to avoid possible interference and permit full coordination of all work. The right to make any reasonable change in location within 6'-0", is reserved by the Architect up until the time of rough-in at no extra cost.

E. Furnish and install electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Capacities and ratings of transformers, cable, switchgear, panelboards, motor control, and other items, arrangement for specified items in general are shown on drawings.

F. Electrical service entrance equipment (arrangements for temporary and permanent connections to the power company's system) shall conform to the power company's requirements. Coordinate fuses, circuit breakers and relays with the power company's system, and obtain power company approval. Provide all required temporary building power and lighting. Remove when finished. Installation of temporary power and lighting shall comply with N.E.C. and OSHA requirements.

G. Ampacities specified or shown on the drawings are based on copper conductors, with EMT conduit accordingly sized. If other conduit or raceway types are used, adjust conduit or raceway sizes accordingly.

H. This Contractor shall coordinate his work under this division of the specifications with the work of other trades wherein it may be interrelated. His work shall be done in such an order that there will be no interference in installing, nor delay in completion, of any part or parts of each respective trade, thereby permitting all construction work to proceed in its natural sequence without unnecessary delay.

I. Before submitting his bid, the Contractor shall familiarize himself with the rules of all governing bodies having jurisdiction and shall notify the Architect in submitting his bid, if in his opinion, any work or material specified is contrary to such rules. Otherwise, the Contractor shall be responsible for the approval of all work and materials and, in case the use of any material specified is not permitted, a substitute shall be approved by the Engineer and shall be provided at no increase in cost.

J. The drawings have been prepared to cover all electrical work under this contract. The Contractor is referred to all other contract drawings to guide him in the proper installation of his work.

K. The Contractor shall fully familiarize himself with the floor drawings, elevations, details of construction, feeders, fixtures, conduit, wiring, service, etc., insofar as it may affect the installation of the work under this specification in order that all necessary materials and labor may be provided even though not specifically referred to on the drawings or called for in the specifications.

L. As the drawings are generally diagrammatic, the final layout of the work shall be subject to the approval of the Architect but the Contractor shall be responsible without increase in contract price for the coordination of all work under various divisions of the specifications.

M. This Contractor shall confer with other Contractors installing work which may affect his work and must arrange his conduit, etc., in proper relation to such work. Any damage resulting from his neglect to do so must be paid for by the Contractor.

N. Where necessary to fit and center with paneling of ceilings and wall spaces, the Contractor must, at his own expense, shift the lighting outlets or other outlets as required by the Architect.

O. All outlets shall be set in such a manner as to finish flush with wall and ceiling lines unless marked to be exposed or surface mounted on the drawings. The height of brackets, switches, outlets, etc., are to be as directed.

P. The Electrical Contractor shall confirm the exact electrical requirements for all equipment supplied by others and installed or connected by the Electrical Contractor. The specific work performed for the installation of any equipment shall be in conformance with the requirements established by the shop drawings of the equipment supplied. In the event the shop drawings establish requirements distinctly different than the requirements shown in the contract documents, the Contractor shall be entitled only to an adjustment of the difference between the work shown and the work required with full credit for labor and materials shown on the original drawings.

Q. The Electrical Contractor shall provide all trenching and backfilling for underground conduits. Unless noted otherwise in other divisions of these specifications, all trenches shall be backfilled and compacted with material defined by the United Soil Classification as ML or CL (silt and clay of low to medium plasticity). Compaction shall be to 90% of ASTM D698.

1.3 MINIMUM REQUIREMENTS:

A. Codes Rules and Regulations: Execute all work under ADA, the latest rules and regulations of the National Electrical Code Standard of the National Board of Fire Underwriters, the National Fire Protection Association, and with all laws, regulations and ordinances of the County, State, City, and the Utility Company.

B. Codes shall govern in case of any direct conflict between codes, plans and specifications; except when plans and specifications require higher standards than those required by code. Variance from the plan and specifications made to comply with code must be approved by the Architect. If approved they shall be made with no increased cost to the Owner.

C. This Contractor shall provide and install only the brands of materials and equipment specified herein, or equipment approved by written addendum by the Architect-Engineer as equal. All material and equipment shall be listed and labeled by Underwriters Laboratories, Inc., indicating compliance with nationally recognized standards and/or tests.

1.4 STANDARDS:

A. All material and equipment shall be listed, labeled or certified by Underwriters Laboratories, Inc., where such standards have been established. Equipment and material which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts,

certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:
   1. Certified: Equipment is "certified" if:
      a. Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards, or to be safe for use in a specified manner.
      b. Production is periodically inspected by a nationally recognized testing laboratory.
      c. It bears a label, tag, or other record of certification.
   2. Nationally recognized testing laboratory: A testing laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

1.5 QUALIFICATIONS (PRODUCTS AND SERVICES):

A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.

B. Product Qualification:
   1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
   2. The Engineer reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will respond within two hours of receipt of notification that service is needed. Submit name and address of service organization.

1.6 MANUFACTURED PRODUCTS:

A. Materials and equipment furnished shall be new, of best quality and design, free from defects, of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts should be available. All items used on this project shall be free of asbestos, PCB, and mercury material.

B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.

C. Equipment Assemblies and Components:
   1. Components of an assembled unit need not be products of the same manufacturer unless indicated otherwise.
   2. Manufacturers of equipment assemblies, which include components made by others, shall be completely responsible for the final assembled unit.
   3. Components shall be compatible with each other and with the total assembly for the intended service.
   4. Constituent parts which are similar shall be the product of a single manufacturer.

D. Factory and Field wiring shall be identified on the equipment being furnished and on all wiring diagrams.

E. When Factory Testing is Specified:
   1. The Engineer shall have the option of witnessing factory tests. The Contractor shall notify the Engineer a minimum of 15 working days prior to the manufacturer making the factory tests.
   2. Four copies of certified test reports containing all test data shall be furnished to the Engineer prior to final inspection and not more than 90 days after completion of the tests.
   3. When equipment fails to meet factory test and re-inspection is required, the Contractor shall be liable for all additional expenses, including expenses of the Engineer.

1.7 EQUIPMENT PROTECTION:

A. Equipment and material shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain. Temporary raceways shall be kept closed and all raceways shall be installed clean and free from dirt and grease.

B. During installation, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter and be vacuum cleaned both inside and outside before testing, operating and painting.

C. Damaged equipment shall be, as determined by the Engineer, placed in satisfactory operating condition or be returned to the source of supply for repair or replacement.

D. Painted surfaces shall be protected with factory installed removable heavy Kraft paper, sheet vinyl or equal.

E. Damaged paint on equipment and materials shall be restored to the original quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.8 PROTECTIVE DEVCIE COORDNIATION STUDY

A. Any project that has breakers that are provided with an adjustable trip setting, those settings must be provided with a coordination study that is provided by the gear manufacturer. The coordination study shall include a time-current curve drawing with recommended settings. The coordination study shall be provided with the gear submittal congruently. The contractor shall be responsible for adjusting the breaker settings to match the coordination study suggestions. If the gear manufacturer does not provide a coordination study, then the electrical contractor shall hire Integrated Consulting Engineers, Inc. to provide the coordination study and respective circuit breaker settings.

1.9 GENERAL WORK REQUIREMENTS:

A. Arrange, phase and perform work to assure electrical service both temporary and permanent for buildings at all times.

B. Coordinate location of equipment and conduit with other trades to minimize interference.

C. Examination of Site:
   1. Visit the site, inspect the existing conditions and check the drawings and specifications so as to be fully informed of the requirements for completion of the work.
   2. Lack of such information shall not justify an extra to the contract price.

D. Permits:
   1. Obtain and pay for all licenses and permits, fees, inspection and certificates required for the execution of this work.
   2. Pay fees and charges for connection to outside services and use of property.
   3. Deliver permits and certificates to the Architect to be transmitted to the Owner.

E. Services:
   1. This Contractor shall pay for all expenses, deposits, reimbursements, etc., required by the local rules and codes for the service to the buildings, complete and ready for use.
   2. Consult power company for their requirements and for coordinating with their installation. Contractor shall provide any work thus required beyond that indicated by drawings and/or specifications and pay for costs incurred for Utility Company to install both temporary and permanent service to the project. All temporary wiring shall be installed per the National Electrical Code. Verify costs with Utility Co. prior to bidding. Verify complete installation and locations of pad mount or pole mount transformers with the local electric utility company and bid installation to comply with their requirements. Contractor shall provide guard posts around electrical transformers and electrical pedestals per Utility Company standards. Contractor shall provide warning tapes above primary and secondary conduits per National Electrical Code. Verify routing of primary and secondary conduits with Utility Co. prior to installation.
   3. This Contractor shall consult all local departments to verify requirements and bid installation of service in accordance with local codes and Utility company rules and regulations.
   4. This Contractor shall bear all expense involved for the complete telephone service conduit installation and pull wire ready for cable installation. Verify complete installation with the local telephone company and bid installation to comply with their requirements.

F. Main Service:
   1. Primary: Coordinate with local electric utility provider
   2. Secondary: Voltage will be 120/240-volt, 1-phase, 3 wire.

G. Responsibility:
   1. This Contractor will be held responsible for any and all damage to any part of the building or to the work of other contractors, as may be caused through this contractor's operation.

   2. Any mutilation of building finishes or equipment initiated by electrical construction shall be properly corrected by the respective finishing contractor and paid for by the Electrical Contractor.
   3. The operation of the temporary power and the permanent electrical system shall be the responsibility of this Contractor until acceptance of the building by the Owner.

H. Work to be done by the General Contractor:
   1. Build in all openings, sleeves, chases, etc., for conduit and equipment as established, furnished and set by this Contractor. The General Contractor shall seal or grout all openings after this Contractor has installed the conduits.
   2. Build in bolts, brackets, hangers etc., for work established, furnished and set by this Contractor.
   3. All concrete work required for equipment furnished and set by this Contractor including clean up pads under electrical gear, fixture bases, transformer bases, etc.
   4. Painting: All painting of electrical equipment installed in finished areas shall be done by the General Contractor. Painting will not be required on receptacles, switches, circuit breakers etc. All fixtures and exterior poles specified to be factory-primed shall be painted by General Contractor. Paint all Wiremold, exposed conduit and equipment, etc., to match final wall or ceiling colors.
   5. Provide fireproofing above fixtures located in fire rated ceilings per U.L. requirements.
   6. Pay all utility costs for operation of electrical system during construction until acceptance of building by the Owner.

I. Work to be done by the Mechanical Contractor:
   1. The Mechanical Contractor shall furnish wiring diagrams and temperature control drawings of all equipment furnished to the Electrical Contractor. (Catalog information is unacceptable, provide point to point drawings.).
   2. The Mechanical Contractor shall furnish and install all control equipment requiring connections to air, water, steam, etc., such as pneumatic electric relays, remote bulb temperature controls, solenoid valves, aquastats and pressure controls.
   3. The Mechanical Contractor shall reimburse the Electrical Contractor for any changes in system design i.e.; control or equipment which affects the Electrical Contractor. Also refer to equipment connections, controls and instrumentation in 26 05 00.

J. Workmanship and coordination:
   1. Make installation substantially as shown on the plans.
   2. Make alterations in location of apparatus or conduit as may be required to conform to building construction without extra charge.
   3. Mechanical equipment service clearances and electrical apparatus service clearances as specified in their respective manufacturer's product data shall be maintained free from conduit.
   4. Cooperate with other trades in their installation of work.
   5. Complete the installation in a workmanlike manner, completely connected and ready to give proper and continuous service.
   6. Use only experienced licensed electricians.

K. Cutting and patching:
   1. Notify the General Contractor in ample time, of the location of all chases, sleeves, and other openings required in connection with the work of this contract.
   2. Cutting and patching made necessary because of failure to comply with the above shall be done by the General Contractor at the expense of the Electrical Contractor.
   3. When it is necessary for the Electrical Contractor to cut building materials, it shall be done in a neat and workmanlike manner meeting with the approval of the Architect and by the mechanics of the particular trade involved.
   4. Holes through concrete shall be carefully drilled with a "Concrete Termite" drill. A Star Drill or Air Hammer will not be permitted. Structural members shall not be cut without approval from the Architect.

5. Any penetrations through the roof shall be made with "Stoneman" flashing connections as manufactured by Stoneman Engineering and Manufacturing Co., Inglewood, Calif., or as approved by the Architect.
6. Any penetrations made in exterior or basement foundation walls shall be sealed with Thunderline "Link-Seal" connections, as manufactured by Thunderline Corporation, Wayne, Michigan.
7. Any holes or voids created in floors, ceilings and walls, including any spaces or gaps around conduit or equipment passing through such areas, which compromise the applicable rating of the floors, ceilings or walls, shall be sealed with an intumescent material equal to "3M Fire Barrier Caulk, Putty or Strip Sheet", "Carborundum Fiberfrax Fyre Putty", "Tremco X-ferno Fire Products", or “Rectorseal Metacalk”. Material equal to the above and meeting U.L. 1479 may be used. All installations shall be per manufacturer's exact instructions.

L. Manufacturers instructions:
1. Apply, install, connect, erect, use, clean, and condition articles, materials and equipment as directed by the manufacturer.

M. Temporary electrical:
1. Make arrangements with electric utility for temporary service.
2. Provide materials, equipment, labor to install, modify, maintain (and upon completion of project, remove) safe temporary electrical power and lighting systems per OSHA standards and NEC requirements.
3. Provide sufficient capacity for construction tools, equipment, temporary ventilation and lighting.
4. Distribute systems throughout building and construction area of site such that an extension cord no longer than 100' will reach any work area. Open branch systems permitted where permitted by the National Electrical Code and OSHA. Provide temporary services to all construction offices as required.
5. Employ permanent systems as they are completed and available.
6. Provide metering of temporary service. All temporary utility costs will be paid by the Contractor.
7. All temporary electrical services shall be removed within 30 days after completion of the building, or 30 days after the premises are used or occupied for which the temporary permit was issued.

N. Demolition:
1. Where remodeling and renovation work is a part of the project, the following shall apply, unless noted otherwise on the drawings:
    a. All items noted to be removed shall be removed complete back to point of supply including conductors and exposed lengths of conduit and raceways. Any raceways removed that are routed into the floor shall be cut off flush with the floor surface and the floor patched for a flat smooth floor surface. All items to remain on circuits where other items are noted to be removed shall be re-circuited as required to maintain continuity of circuit or system. All light fixtures, equipment, receptacles, devices, fire alarm and nurse call devices, door security devices, and sound system devices noted to be removed and not relocated shall be offered to the Owner. If the Owner elects not to retain these items, they shall become Contractor salvage and shall be removed from the job site. The Contractor shall remove from the job site all other items noted to be removed (verify all items with Owner). Where existing flush mounted devices are noted to be removed from walls to

remain, remove device, coverplate, and conductors and install blank cover plate over flush backbox. Electrical Contractor shall remove existing coverplates for all existing devices to remain in remodeled and renovated areas that will receive new wall finishes and reinstall cover plates after new wall finishes are complete. All existing light fixtures and devices not shown or indicated otherwise on the drawings in existing areas are to remain.

b. Electrical Contractor shall remove all existing light fixtures, devices and wiring from all existing walls, partitions, and ceilings to be removed, and shall remove all existing light fixtures and wiring in rooms where new lighting is shown, unless noted otherwise on the drawings.

c. Electrical Contractor shall review all specifications and all drawings to coordinate installation of new equipment and devices of other trades with existing conditions. Remove and relocate existing raceways, conductors, and boxes as required for installation of new equipment or devices.

d. Schedule all downtimes associated with any new service revisions a minimum of one (1) week prior to interruption of services. No interruptions of any electrical work shall be made without prior consent of the Owner. Contractor shall submit to the Owner a schedule of downtimes for the Owners review and approval.

1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS:

A. The Contractor shall obtain from the Architectural and Structural drawings the exact location and size of spaces available for his apparatus and material and shall install them accordingly. In case the space allowed is not sufficient, or an obstruction interferes with placing them as shown or specified, the Contractor shall obtain instructions from the Architect and shall install them as directed without extra charge. These provisions refer only to exactness of positions that cannot be determined from the drawings and do not permit placing apparatus distinctly different from that shown on the drawings.

B. Working spaces shall not be less than specified in the National Electrical Code for all voltages specified.

C. Inaccessible Equipment:

1. Where the Engineer determines that the Contractor has installed equipment without proper clearances or not readily accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost to the Owner.
    a. Install access panels as approved by the Architect to provide access to all equipment, J-boxes and outlets located in non-accessible spaces. Panels shall be flush locking type with a fire rating equal to the ceiling system.
2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and ductwork. Outlet and box covers shall be removable by using regular length (8") screw drivers.

D. Distribution Equipment:

1. All items of Electrical Distribution Equipment (switchboards - panelboards - disconnects) shall be of one manufacturer, unless specifically noted on the drawings, in the specifications, or approved by written addendum by the Engineer. Intermixing of distribution equipment by different manufacturers will not be permitted.

2. If shown on the drawings, provide a surge arrester for lightning protection on each service entrance for each building. Refer to drawings for voltage and phasing of service. Arrester shall be located within or adjacent to the main switch, panel or switchboard enclosure and connected with 12” maximum leads. Surge Arrester shall be equal to Current Technology SEL200-DM-L3 Series.
3. Equipment layouts on the drawings are based on one manufacturer. Verify all actual equipment sizes with equipment manufacturer prior to bidding.
4. If layout changes are required due to differing electrical manufacturers equipment size, they must be submitted to and approved by the Engineer. National Electric Code working clearances must be maintained at all times. Extra remuneration will not be allowed for layout changes that differ from those shown.
5. Provide and install all steel supports as required for mounting of electrical equipment.
6. Anchor all free standing electrical equipment including switchboards, switchgear, substations, motor control centers, paralleling gear, transfer switches, transformers, etc. to the floor with plated, 1/2" diameter minimum, anchor bolts or as recommended by the manufacturer.

1.11 EQUIPMENT CONNECTIONS, CONTROLS AND INSTRUMENTATION:

A. General: The following applies to all electrical power and control connections for all equipment requiring electrical installation work provided by others.

B. The Electrical Contractor shall furnish, install and connect all wiring, conduit, boxes, toggle switches, thermal switches, disconnect switches, remote push-button stations not included in magnetic starters, etc., for all equipment requiring electrical power that is furnished by other contractors and/or the Owner, as required for a complete and operating system. The Electrical Contractor shall receive, install and connect all magnetic starters and controllers, capacitors, power factor correction devices, transformers, alarms, bells, horns, relays, remote switches, etc., for equipment supplied by others, (i.e. starters, capacitors or power factor correction devices for mechanical equipment, etc.). In general all major equipment will be specified to be factory prewired with only service and interlocking required at the site by the Electrical Contractor; however he shall check all divisions of the specifications to verify if the equipment is specified factory prewired and if not, then it shall be the responsibility of the Electrical Contractor to provide the complete wiring of the equipment in accordance with wiring diagrams, and temperature control drawings provided by the other contractors and/or the Owner, to the Electrical Contractor. All interlocking of equipment shall be by the Electrical Contractor.

C. All line and low voltage wiring and connections required to control the equipment and/or dampers are a part of this section. All wiring shall be in conduit. Provide and install line or low voltage wiring to all dampers as required for system operation. All low voltage wiring, conduit, connections and/or terminations are by the Electrical Contractor unless specifically noted otherwise within the bidding documents.

D. The Electrical Contractor shall provide to each Mechanical Control Panel a 120 volt control power supply; #12 Ga. CU. THHN/THWN in 1/2"C. minimum at all points required by controls, instrumentation and sprinkler risers. Circuit as shown on the plans or to the nearest 120 volt panel if no circuiting is indicated. Provide 20 Amp. breakers unless otherwise indicated. Each control panel shall be on a separate circuit unless otherwise indicated. If the controlled equipment is fed from the emergency system, then the control power supply must

feed from the emergency system. Electrical Contractor to provide at each Mechanical Control Panel a CAT 6 drop as required, coordinate with mechanical contractor.

E. The Contractor shall become familiar himself with the equipment to be furnished by the other Contractors and/or the Owner in connection with this work and include provisions for such connections and work in the Contractor's price. Extra remuneration will not be allowed for such work.

F. Connections to all equipment have been designed from units as specified on the drawings or in the specifications. In the event equipment or control differs on approved shop drawings it shall be the responsibility of the Supplying Contractor to coordinate electrical connections to the units and reimburse Electrical Contractor for any changes in system design. These changes shall not involve additional cost to the Owner.

G. Review all plans, specifications, and approved shop drawings of all trades to verify all equipment connections that are required by mechanical and/or other contractors. Although the electrical drawings will show equipment connection requirements, it is the Electrical Contractor's responsibility to connect all equipment furnished by other Contractor's at no extra cost to the Owner, even if this equipment connection is not shown on the electrical drawings. Coordinate all required connections not shown on the electrical drawings with the Engineer.

H. Electrical Contractor to provide and install all boiler remote shut down switches and chiller remote shut down switches as required by Codes. Connect to equipment as required. Install nameplates at switches indicating use. Mount switches at 4'-0" AFF.

I. Service receptacles and disconnect switches mounted on mechanical equipment shall be located as not to obstruct access doors to equipment. Provide weatherproof-in-use covers on receptacles at exterior HVAC units, whether or not the receptacles are furnished with the equipment.

J. All power burner boilers or boilers with a BTUH input of 400,000 or more shall be provide with a manually operated emergency shut off switch. This includes units designated as water heaters that meet these requirements. The emergency shutdown switch shall be installed by each exit from the associated room the equipment is located in and labeled accordingly. Location to be per code requirements. The emergency switch shall disconnect power to the burner controls per the manufacturer’s recommendations. Provide all required switch(es), contactor(s), interconnection, etc. as required to give a complete and functional system.

1.12 NAMEPLATES:

A. General: The following items shall be equipped with nameplates:
   1. Disconnect switches (fused or nonfused), transformers, switchgear, switchboards, panelboards, separately mounted circuit breakers, starters, contactors, relays, junction boxes and pull boxes.
   2. Special Electrical Systems (fire alarm, sound system, emergency system, etc.) shall be so identified at junction and pull boxes, terminal cabinets and equipment racks with a permanent, waterproof means of identification. (Example – FIRE ALARM). Free hand lettering or adhesive tape type label markers will not be acceptable.

3. Wall switches or other control devices controlling equipment or special lighting configuration shall have either engraved wall plates or shall be provided with engraved nameplates.
4. All devices on the emergency system shall be 'Red' with coverplates to match remainder of devices in the building. Coverplate to be engraved with panel name and circuit number.

B. Inscription: Nameplates shall adequately describe the function or use of the particular equipment involved. Nameplates for panelboards and switchboards shall include the panel designation, voltage, phase, A.I.C. rating of the devices, color coding of conductors, and location that panel is fed from. (See schedules, one-line diagram, and conductor color coding). For example, "Panel A 120/208 V, 3-Phase, 4-Wire, 10,000 A.I.C. Phase A: Black, Phase B: Red, Phase C: Blue, Neutral: White, Ground: Green, Fed From Panel MDP".

The name used for a machine nameplate shall be the same as the one used on the machine's motor starter, disconnect and P.B. station nameplates. Nameplates for fused switches and panels shall also indicate fuse type and size. All panelboards fed from the emergency system shall be labeled "Emergency System", in addition to the instructions listed above.

C. Construction: Nameplates shall be laminated phenolic plastic white front and back with black core. Nameplates for emergency system panelboards and transfer switch shall be laminated phenolic plastic red front and back with white core. Lettering shall be engraved through front layer to form 1/4" black characters. Nameplates shall be securely fastened to the equipment to be identified, with No. 4 Phillips, round head, cadmium plated, steel self tapping screws or nickel plated brass bolts. Motor nameplate may be nonferrous metal not less than 0.03 inches thick, die stamped. In lieu of separate plastic nameplates, engraving directly on device plates is acceptable. Letters engraved thus, shall be filled with contrasting enamel. All nameplates and their installation are part of this work. Free hand lettering or Dymo Label marker will not be acceptable.

1.13 MATERIALS OF APPROVED EQUAL:

A. Where items of equipment and/or materials are specifically identified herein by a manufacturer's name, model or catalog number, only such specific items may be used in the base bid, except as hereinafter provided.

B. Unless requests for changes in base bid specifications are received, approved and noted by written addendum prior to the opening of bids, the successful contractor will be held to furnish specified items.

C. After contract is awarded, changes in specifications shall be made only as defined under "Substitution of Equipment".

1.14 SUBSTITUTION OF EQUIPMENT:

A. After execution of the contract, substitution of equipment of makes other than those specifically named in the contract documents, may be approved by the Engineer, only if the equipment named in the specifications cannot be delivered to the job in time to complete the work in

proper sequence and due to conditions beyond control of the Contractor. Provide documentary proof in writing from the manufacturer that the specified equipment will not be available in time. If the Contractor is responsible for the delay, the substitution will not be approved.

B. Requests for substitutions must be accompanied by documentary proof of equality or difference in price and delivery, if any, in form of certified quotations from suppliers of both specified and proposed equipment.

C. The Owner shall receive all benefits of the difference in cost involved in any substitution, and the contract altered by change order to credit Owner with any savings so obtained.

1.15 SUBMITTALS: In accordance with Section SAMPLES AND SHOP DRAWINGS, Contractor shall, within 15 days after award of contracts, begin sending to the General Contractor for review submittals containing the following:

A. The Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site.

B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Engineer to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.

C. Submittals shall be complete and submitted together for each section. Individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assemble as a whole. Partial submittals will not be considered for approval.
   1. Mark the submittals, "SUBMITTED UNDER SECTION ". Mark out all statements on sheets that do not apply otherwise. The Engineer may select options and equipment not originally specified. All options that are not marked out will be assumed that the Contractor will furnish the same.
   2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
   3. Submit each section separately.
   4. Mark catalog cuts to indicate equipment, capacities, finishes, sizes, etc. Each individual item shall have its own sheet provided for approval. (Example: Separate sheets for each panelboard.)

D. The submittals shall include the following:
   1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
   2. Elementary and interconnection wiring diagrams for communication and signal systems, control system and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
   3. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
   4. Quantities of materials will not be verified by the Architect or Engineer. Review stamp on shop drawings does not constitute review of quantities listed on shop drawings.

5. Shop drawings:
   a. All shop drawings shall be checked and signed by this contractor and general contractor prior to submittal to the Architect/Engineer. Equipment, materials, etc., not meeting specifications and/or drawing requirements shall be returned to the supplier for corrections before they are submitted to the Architect-Engineer. This Contractor is reminded that only those materials specified, approved or otherwise indicated by the project specifications, drawings, or addenda will be permitted to be used in constructing the electrical work for this project. The first review of submittals (shop drawings) will be provided as indicated at no charge to the Contractor. However, subsequent review(s) of resubmittals required by "Rejected" status from the original review will necessitate the Electrical Contractor being charged by the electrical consultant a fee of $65 per man-hour, with a minimum charge of $100 for each item resubmitted. It is intended that all electrical submittals be made in a complete and timely fashion such as to permit a comprehensive and thorough review of same.
   b. Shop drawings submitted without Contractor’s signatures or approval and verification will not be approved.
   c. Shop drawings shall be submitted on wire, cables, devices, lighting fixtures (including distribution curves), motor starters, panelboards, disconnects, substations, transformers, switchgear, switchboards, motor control centers, conduit, raceway systems, all systems, etc.
6. Each sheet shall be either 8 1/2" x 11"; 8 1/2" x 13"; or 11" x 17" bond with a 5" x 3" clear area for engineer’s stamp. (This area shall not be used by this contractor or the general contractor’s stamp.) Larger drawings shall be able to be blue printed.
7. Submittals for all systems (fire alarm, security, PA, controls, sound, clock, nurses call, intercom, etc.) shall include complete riser diagrams showing all conductors and conduit sizes.

E. Engineer’s acceptance of Compliance Submittals will not relieve the Contractor from his responsibility for any deviations from the requirements of the contract documents, unless Contractor has in writing called Engineer's attention to such deviation at the time of submission and the Engineer has given written approval to the specific deviation; nor shall any acceptance by Engineer relieve Contractor from responsibility for errors or omissions in Compliance Submittals.

F. Quantity of Submittals: See the general specification sections.

1.16 ELECTRICAL WORK COMPLETION:

A. Before requesting final inspection the following work must be completed.

B. Operating Instructions:
1. The Contractor shall submit along with the shop drawings of the equipment, four (4) copies of operating instructions for all items. Instructions shall be prepared by the manufacturer of the equipment.
2. After the operating instructions have been approved by the Engineer, the Contractor shall include the four (4) copies in maintenance instructions brochures.
3. The Contractor shall also obtain all manufacturer's instructions, manuals, and one complete set of drawings and turn these over to the Architect at the completion of the project.

4. The Contractor shall keep in a safe place, all keys and special wrenches furnished with equipment under this contract and shall give same to the Architect at the completion of the project.
5. The Contractor shall prepare four (4) complete brochures covering all systems and equipment furnished and installed under his contract. Brochures shall be submitted to the Architect-Engineer for approval and delivery to the Owner. The Engineer will retain one copy. The cost of this brochure shall be included in the contract cost. Brochures shall contain the following:
   a. Certified equipment drawings and/or catalog data clearly marked for equipment furnished as required for approval submission under detailed section of the specifications.
   b. Complete operating and maintenance instructions for each item of equipment.
   c. Complete part list for each equipment item.
   d. Any special emergency operating instructions or a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to the various parts of the system.
   e. Reviewed shop drawings with reviewed stamp of Engineer.
   f. System test reports.
6. Brochures shall be bound in hard backed three ring binders with an index, sub-dividers and reinforced sheets.
   a. Project name, and address, and date of submittal.
   b. Section of work covered by brochure, i.e., "Electrical Work".
   c. Name and address of Architect.
   d. Name and address of Engineer.
   e. Name and address of Contractor.
   f. Telephone number of Contractor, including night or emergency number.
7. In addition to these written instructions, each respective Contractor shall fully and carefully instruct the Owner, or Owner’s selected representatives, as to the proper operation, care and maintenance of each system and its equipment.
8. Fire Alarm, Security, Sound, PA, Clock, etc., Systems: The manufacturer shall conduct and record a device by device test. Verify completely proper operation. Record all items checked for each device and device location on a form. Submit this final checkout form to the Engineer.

1.17 TESTING AND ADJUSTMENT:

A. All equipment shall be checked for proper adjustment and balance. All panelboards, distribution panels, switchboards, and transformers shall be balanced to provide a balanced load on each phase. A complete record of all such adjustments shall be made. Final readings shall be submitted to the Architect-Engineer for records. The Contractor shall provide all equipment, instruments, gauges, meters, etc., as required for the complete checking of these systems.

B. Mechanisms of all electrical equipment shall be checked, adjusted, and tested for proper operation. Adjustable parts of all lighting fixtures and other electrical equipment shall be checked, adjusted, and tested as required to produce the intended performance.

C. Completed wiring system shall be free from open or shorted circuits. After completion, this Contractor shall perform tests for insulation resistance in accordance with the requirements of the National Electrical Code.

D. The Contractor shall maintain service and equipment for the testing of electrical equipment and apparatus until all work is approved and accepted by the Owner. A first class voltmeter and ammeter shall be kept available at all times and this Contractor shall provide service for test readings when and as required. All test readings shall be recorded on an approved form and submitted to the Architect.

E. Before final acceptance is made, this Contractor shall, at his own expense, frame under plastic the sequence of operations of the sound system, controls, fire alarm, etc., for each and every item requiring instructions. These instructions shall be mounted as directed. He shall cover same with Engineer and/or his selected parties, and shall adjust all apparatus and place same in satisfactory operating service as approved by the Engineer.

F. Final observation will be made upon written request from the Contractor after the project is complete. At the time of final observation, the Contractor shall be present or shall be represented by a person of authority. The Contractor shall demonstrate, as directed by the Architect-Engineer, that his work fully complies with the purpose and intent of the drawings and specifications. All labor, services, and all instruments or tools necessary for such demonstration and tests shall be provided by the Contractor.

1.18 AS-BUILT DRAWINGS:

A. E.C. shall prepare and submit to the Engineer, upon completion of the project, one complete set of reproducible "As Built" drawings for the electrical portion of the project.

B. Drawings shall clearly indicate any and all approved deviations (i.e. addendum items, change order data, etc.) from the Project Bid Documents.

C. These drawings will become the property of the Owner and will be for his future reference file, record document.

1.19 FINAL OBSERVATION:

A. Final observation will be made upon written request from the General contractor after the project is completed; in accordance with the Supplementary General Conditions.

B. Furnish a workman familiar with this project to accompany the Engineer on final observation and have available ladders, drop cords, and other equipment as required to gain access to any portion of this system.

C. This Contractor and his principal subcontractors shall be represented at the inspection by a person of authority responsible to demonstrate to the engineer that his work conforms to the intent of the plans and specifications.

D. Extra observations made necessary by the Electrical Contractor's failure to comply with the conditions as set forth above shall be charged to the Contractor for the Inspector's time both on the job and spent in travel between the office and the project site.

1.20 GUARANTEE:

A. This Contractor, by the acceptance of this specification and the signing of his contract, acknowledges his acquaintance with the requirements and guarantees that every part used in constructing the system as herein described will be of the best of its respective kind that can be obtained and will be erected in a most thorough and substantial manner by none but experienced workmen.

B. He guarantees that all conduit as provided within and by this specification will be free from all obstructions of every description and will be free from holes or broken places and be well bonded together. He guarantees that all wiring and conduit to be used in construction of this project will be new and unused.

C. He further guarantees to hold himself responsible for any defects which may develop in any part of the entire system, including apparatus and appliances provided under this section of the specification, and to replace and make good without cost to the Owner any such faulty parts of construction which develop defects at any time within one year from date of final certification of completion and acceptance. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to the Owner's satisfaction, advise Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. Architect will then suggest course of action. The Electrical Contractor shall replace material and equipment that requires excessive service during guarantee period as defined and as directed by the Architect. This guarantee does not include ordinary lamp failure.

D. Use of systems provided under the Specification for temporary services and facilities shall not constitute Final Acceptance of the work nor beneficial use by the Owner, and shall not institute guarantee period.

1.21 SINGULAR NUMBER:

A. Where any device or part of equipment is referred to in these specifications or on the drawings in the singular number (such as "the switch"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.22 PERFORMANCE:

A. Provide as part of the work of this contract, in addition to the first year guarantee on equipment and materials, the following described routine maintenance and inspection. (The one year time period will not start until each and every item is complete in accordance with drawings and specifications and accepted by the Owner). Check all emergency systems, control, fire alarm, transformers, etc., correct and adjust same. This service to be provided during the guarantee period.

1.23 SYSTEM:

A. System: Distribution characteristics shall be as indicated on drawings.

1.24 SUPPLEMENTARY CONDITIONS:

A. Supplementary to all other terms of the contract, this work shall be performed subject to the following conditions.

B. Materials and equipment installed on this project shall be first class in quality and shall be new and unused.

C. Workmanship on this project shall be first class work performed by the experienced licensed mechanics of the proper trade.

D. Work under this contract shall be adequately protected at all times. Storage, parking, signs, advertisement, fires and smoking shall conform to all applicable regulations and/or directions of the Architect.

E. Measurements on job and shop layouts required for installation of work shall be the responsibility of the contractor and acceptance of work is subject to approval of shop drawings by the Architect.

F. Contractor shall furnish all hoists, scaffolds, staging, runways and equipment necessary for the completion of this work.

G. Obtain and pay for all required electrical permits and licenses.

H. Maintain lights and guards required for safety.

I. Remove temporary service after use.

1.25 CONTRACT CHANGES:

A. All changes or deviations from the contract, including those for extra or additional work, must be submitted in writing for the approval of the Architect/Engineer. No verbal orders will be recognized.

1.26 RUBBISH/CLEANUP:

A. All rubbish resulting from the work herein specified shall be periodically removed by this Contractor.

B. Clean all electrical equipment and materials of all foreign matter (both inside and out). Clean all light fixtures using only methods and materials as recommended by the manufacturer.

1.27 PROPOSALS:

A. The Contractor shall consult the General Conditions and the Proposal Form for proposals and subdivisions of the work required.

1.28 EXTENT OF WORK:

A. The extent of the work under this heading of the contract shall be the furnishing of all plant, labor, materials, and equipment as required to complete work as shown on the drawings and as specified under this heading, and all plant, labor, materials and equipment not shown on the drawings or specified, but necessary to make installation complete in accordance with the intent of the contract, to provide first class, complete, and operative installation throughout.

1.29 TAXES:

A. Contractor shall include all applicable local, state and federal taxes in his bid. Consult the Supplementary Conditions of these specifications relative to any and all tax exemptions permitted for this project.

END OF SECTION

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section includes the furnishing, installation, and connection of the power, lighting, system, and control wiring.

PART 2 - PRODUCTS

2.1 CABLE AND WIRE (POWER AND LIGHTING):

A. Cable and Wire: Fed. Spec. J-C-30, except as hereinafter specified. All conductors shown on plans are sized for copper. UL label required. American, Southwire, Essex, or equal, rated 600 volts, finished with fadeless color coding and bearing Underwriters label.

All cable and wiring shall be continuous between electrical equipment. Splices shall not be added except as required for taps in branch circuits or as approved by the engineer. No splices will be allowed within panelboards and switchboards.

B. Single Conductor:
1. Soft annealed copper.
2. All conductors #8 gauge and larger shall be stranded unless noted otherwise All conductors #10 gauge and smaller may be solid or stranded unless noted otherwise on the drawings. Stranded conductors may be used only on devices and lugs that are U.L. listed for use with stranded conductors.
3. Minimum size No. 12, except where larger sizes are shown. (Size No. 14 minimum for controls).

C. Insulation:
1. Wires for general use within the building shall be type THHN or type THWN, 90 degree rated except where called for otherwise on the drawings. Type THHN or type THWN shall be used at the temperature rating of equipment termination lugs, environmental conditions, and as Code allows. Wires for other than general use shall be as hereinafter specified for specific services.

D. Multiconductor Cables:
1. Comply with NEMA WC 70; Exterior sheath shall be color coded to distinguish between cable voltages and quantity of phase conductors.
2. Type AC Cable, Armored cable, shall comply with UL 1479 and UL 4 with green grounding conductors in addition to Armor/Bond wire ground combination. Cables shall be listed for use in environmental air space in accordance with NFPA 70 Article 300.
3. Type MC Cable, Metal-clad cable; shall comply with UL 1479 and UL 1569 with green grounding conductors. Cables shall be listed for use in environmental air space in accordance with NFPA 70 article 300.

E. An equipment grounding conductor, sized per NEC Article "Grounding", shall be installed in each conduit containing phase conductors.

F. Color Code:

1. All conductors shall be identified by circuit number and color coding at all termination points and splices. All conductors shall be identified in all pull and junction boxes by the following method of color coding. Means of identification shall be permanently posted at each branch circuit panel with a nameplate identifying color coding system used in that panelboard.

Phase	208/120V	480/277V	240V.	240/120V
A	Black	Brown	Black	Black
B	Red	Orange	Red	Red
C	Blue	Yellow	Blue**	
Neutral	White	Gray*		White
Ground	Green	Green	Green	Green
Iso. Grd	Green w/Yellow	Green w/Yellow	Green w/Yellow	Green w/Yellow

* or white with colored (other than green) tracer.
**Identify 'High Leg' per N.E.C.

2. Use solid color compound or solid color coating for No. 6 and smaller branch circuit conductors and neutral sizes.
3. Phase conductors No. 4 and larger color code using one of the following:
   a. Solid color compound or solid color coating.
   b. Colored as specified using 3/4-inch wide tape. Apply tape in two layers, half overlapping turns for a minimum of three-inches for terminal points, and in junction boxes, pull boxes, troughs, manholes, and handholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable stating size and insulation type. Where any conductor is or can be supplied from an emergency system, the Contractor shall mark each conductor with an additional two layers, one-half lapped, of purple colored vinyl electrical tape.
   c. Yellow stripe on isolated ground may be 1/4-inch wide yellow tape on top of green.
4. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.
5. Provide plastic engraved color code legend on each panelboard and switchboard per NEC Article "Branch Circuits", "Identification Of Ungrounded Conductors".
6. All improperly color coded conductors will be completely replaced at no additional cost to Owner.

G. See riser diagrams and/or other sections of the Specifications for types and ratings for sound, fire alarm, control and other special cables.

H. Where quantities of conductors in a raceway system are not specifically indicated, provide the number as required to maintain function, control and number of circuits as indicated.

I. All isolated ground circuits shall be provided with separate phase, neutral, and ground conductors (no shared neutrals or grounds). All isolated ground circuits shall be installed in separate raceways from all other circuiting.

J. Where multiple sets of conductors are indicated, do not install the same phase conductors in the same raceway. Each raceway shall be provided with A, B, C phase conductors, neutral (if indicated), and ground (if indicated).

K. Where GFCI circuit breakers are used, provide a separate neutral conductor for the GFCI circuit. (Not a shared neutral with another circuit).

2.2 SPLICES AND JOINTS:

A. In accordance with UL 486 A, B, D and NEC.

B. Splices and taps for #6 and larger conductors shall be made with block type terminations (with insulating jacket) or with split bolt connectors, covered and completely insulated with a minimum of three half-lapped layers of Scotch No. 33+ (105 degree C) plastic electrical tape or by approved insulated fastener. All splices and taps having irregular surfaces shall be properly padded with Scotchfil putty before application of insulating plastic tape. Scotchlok electrical pre-insulated spring pressure connectors or equal may be used for up to #8 conductors.

2.3 CONTROL WIRING:

A. All control wiring shall be copper, solid or stranded, #14 Ga. or larger depending upon current requirements, with insulation type for 90 C. rating. Where stranded conductors are used, provide with spade type insulated copper terminals. Unless noted otherwise on the Mechanical drawings or herein, all mechanical control wiring for all systems shall be routed within conduit, shall be of the same insulation type and shall be continuous between outlets and boxes (with no splices or taps into conduit). All line and low voltage mechanical control wiring, conduit, connections, and/or terminations are by the Electrical Contractor unless specifically noted otherwise within the bidding documents.

2.4 WIRE LUBRICATING COMPOUND:

A. The cable pulling lubricant shall be compatible with all cable jackets. The lubricant shall be UL (or CSA) listed. The lubricant shall contain no waxes, greases, silicones, or polyalkylene glycol oils or waxes.

B. A 200-gram sample of the lubricant, when placed in a one-foot, split metal conduit and fully dried for 24 hours at 105 degrees C, shall not spread a flame more than three-inches beyond a point of ignition at a continued heat flux of 40 kW/m^2. Total time of test shall be one-half hour.

C. Approved Lubricant is:

1. Dyna Blue
2. Polywater J available from:
3. American Polywater Corporation

4. Equal by Quick Slip from Buchanan
   CCR Wire Pulling Lube from CRC
   Poly-X from American Colloid.

2.5 FIREPROOFING TAPE:

A. The tape shall consist of a flexible, conformable fabric of organic composition coated one side with flame-retardant elastomer.

B. The tape shall be self-extinguishing and shall not support combustion. It shall be arcproof and fireproof.

C. The tape shall not deteriorate when subjected to water, gases, salt water, sewage, or fungus and be resistant to sunlight and ultraviolet light.

D. The finished application shall withstand a 200 ampere arc for not less than 30 seconds.

E. Securing tape: Glass cloth electrical tape not less than 7 mils thick, and 3/4-inch wide.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERALLY:

A. Install in accordance with the NEC, and as specified.

B. Unless noted otherwise on the Electrical drawings or herein, all feeders and circuits for all systems shall be routed within conduit, shall be of the same insulation type and shall be continuous between outlets and boxes (with no splices or taps into conduit).

C. Branch circuits concealed in ceilings, walls and partitions: Single conductors in raceways. Type AC and Type MC in locations limited to the following:

1. Type AC and Type MC are acceptable for the following applications:
   a. Install cables for lighting fixtures whips and for branch circuits concealed in walls and partitions only. Locate junction box and convert to single conductors in rigid raceway within 24-inches from the point the cable exits the wall. Do no install cable in the web of metal studs.
      1) Use only single-circuit cable (i.e. two wire plus ground). For devices in the same wall connected to different circuits, install separate single circuit cable for each circuit.
2. Type AC and Type MC are **not** acceptable for the following applications; instead provide single conducts in rigid raceway:
   a. Homeruns to panelboards.
   b. Branch circuits and feeders serving HVAC equipment, elevator equipment, and kitchen loads.
   c. Within mechanical, electrical or communication rooms.

d. Exposed branch circuits within areas that do not have ceilings (i.e. exposed to structure) or rooms with cloud ceilings that have exposed structure around the perimeter of the room.

D. Splices and taps in outlet boxes shall be twisted joints. U.L. approved pre-insulated spring pressure connectors shall be used for branch circuit connections. Connectors shall be installed so that all conductors are properly insulated.

E. Splice cables and wires only in outlet boxes, junction boxes, pull boxes, manholes, or handholes. Do not splice cables in panelboards, switchboards, disconnects, etc.

F. Install cable supports for all vertical feeders in accordance with the NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.

G. For panelboards, cabinets, wireways, switches, and equipment assemblies, neatly form, and tie all cables.

H. All exposed conduit located in architecturally finished areas shall be painted to match finish color selected by architect.

I. Seal cable and wire entering a building from underground between the wire and conduit, where the cable exits the conduit, with a non-hardening approved compound.

J. Wire Pulling:
1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling of cables.
2. Use ropes made of nonmetallic material for pulling feeders.
3. Attach pulling lines for feeders by means of either woven basket grips or pulling eyes attached directly to the conductors, as approved by the Engineer.
4. Pull multiple cables into a single conduit with a single continuous pull.
5. Always use wire lubricant per this specification.

K. Elevators
1. If an elevator is provided with a battery lowering device, the contractor shall be responsible for providing the low voltage wiring between the battery lowering device and the auxiliary contact located in the elevator power module or local disconnecting device. Provide an auxiliary contact located in the elevator power module or local disconnecting device if not already specified. Coordinate all requirements with the equipment manufacturer prior to bid.

3.2 SPLICE INSTALLATION:

A. Splices and terminations shall be mechanically and electrically secure.

B. Where the Engineer determines that unsatisfactory splices or terminations have been installed, remove the devices and install approved devices at no additional cost to the Owner.

3.3 CONTROL, COMMUNICATION, AND SIGNAL WIRING INSTALLATION:

A. Unless otherwise specified in other sections of these specifications, install wiring as described below. Wiring shall be connected to perform the functions shown and specified in other sections of this specification.

B. Except where otherwise required, install a separate power supply circuit for each system, or control equipment, or control power. Circuit to nearest 120 volt panel or nearest emergency panel if equipment controlled is connected to emergency system. Provide 20 Amp breakers in panels where none are designated. Verify all requirements with actual equipment supplied in field.

C. Install a breaker lock-on clip on the handle of the branch circuit breaker for the power supply circuit for each system to prevent accidental de-energizing of the systems.

D. System voltages shall not exceed 120 volts and shall be lower voltages where shown on the drawings or required by the NEC.

E. Wire and cable identification:
   1. Install a permanent wire marker on each wire at each termination, outlet box, junction box, panel, and device.
   2. Identifying numbers and letters on the wire markers shall correspond to those on the wiring diagrams used for installing the systems.
   3. Wire markers shall retain their markings after cleaning.

3.4 FIELD TESTING:

A. Feeders and branch circuits shall have their insulation tested after installation and before connection to utilization devices such as fixtures, motors, or appliances.

B. Test shall be performed by meggar and conductors shall test free from short-circuits and grounds.

C. Test conductors phase-to-phase and phase-to-ground.

D. Meggar motors after installation but before start-up and test free from grounds.

E. The Contractor shall furnish the instruments, materials, and labor for these tests.

END OF SECTION

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies general grounding and bonding requirements of electrical installations.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS:

A. General Purpose: UL and NEC approved types, copper, with THHN or type THWN, or dual rated THHN-THWN insulation color identified green, 90 degree rated.

B. Size conductors not less than what is shown and not less than required by the NEC.

2.2 GROUND RODS:

A. Copper clad steel, 3/4-inch diameter by 10 feet long.

2.3 SPLICES:

A. All splices and grounding electrode connections shall be made with exothermic welds.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERALLY:

A. Ground in accordance with the NEC as shown, and as hereinafter specified. All equipment ground conductors shall be terminated on a ground bus or ground lug attached to equipment can.

B. System Grounding:
   1. Secondary service neutrals shall be grounded at the supply side of the secondary disconnecting means and at the related transformers.
   2. Separately derived systems (transformers downstream from the service entrance) ground the secondary neutral.
   3. Individual Buildings: Bond Main Disconnect ground bus to water pipe, and driven ground. Provide bond to 20 foot re-bar in foundation or to building steel, if indicated on the drawings or required by local Codes.

C. Equipment Grounding:
   1. Metallic structures, enclosures, raceways, junction boxes, outset boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be grounded for personnel safety and to provide a low impedance path for possible ground fault currents.

3.2 SECONDARY EQUIPMENT AND CIRCUITS:

A. Main Bonding Jumper: Connect the secondary service neutral to the ground bus in the service equipment.

B. Water Pipe and Supplemental Electrode:
   1. Provide a ground conductor connection between the service equipment ground bus and the metallic water pipe system. Jumper insulating joints in the water pipe.
   2. Provide a supplemental grounding electrode and bond to the water pipe ground, or connect to the service equipment ground bar.

C. Service Disconnect: Provide a ground bar bolted to the enclosure with lugs for connecting the various grounding conductors. Connect the neutral to the ground bus (main bonding jumper).

D. Switchgear, Switchboards:
   1. Connect the various feeder green grounding conductors to the ground bus in the enclosure with suitable pressure connectors.
   2. Connect the grounding electrode conductor to the ground bus.
   3. Connect metallic conduits, which terminate without mechanical connection to the housing, by grounding bushings and ground conductor to the ground bus.

E. Transformers:
   1. Exterior: Exterior transformers supplying interior service equipment shall also have the neutral grounded at the transformer secondary. Provide a grounding electrode at the transformer.
   2. Separately derived systems (transformers downstream from service equipment): Ground the secondary neutral at the transformer. Provide a grounding electrode conductor from the transformer to the nearest cold water pipe.

F. Raceway Systems:
   1. Ground all metallic raceway systems.
   2. Raceway provided for mechanical protection containing only a grounding conductor, bond to that conductor at the entrance and exit from the raceway.

G. Feeders and Branch Circuits: Install green grounding conductors with feeders and branch circuits in all feeders and branch circuits and in any raceway containing a phase conductor.

H. Isolated Grounds: All isolated grounds must be insulated and must terminate on isolated ground buses in the equipment. No other equipment grounds shall be connected to isolated ground bus. Where isolated grounds are shown and PVC conduit is used, an equipment ground must be installed to ground metallic boxes and mounting straps. Provide separate isolated ground for each circuit. (No shared ground conductors for isolated circuits).

I. Boxes, Cabinets, Enclosures, and Panelboards:
   1. Bond the grounding conductors to each pullbox, junction box, outlet box, cabinets, and other enclosures through which the ground conductors pass (except for special grounding systems for intensive care units and other critical units shown.).
   2. Make ground conductor connections to ground bus in motor control centers, panelboards, etc.

J. Receptacles and toggle switches are not approved for grounding through their mounting screws. Ground devices from the grounding conductor of the wiring system to the green ground terminal on the device.

K. Ground lighting fixtures to the green grounding conductor of the wiring system.

L. Fixed electrical appliances and equipment shall have a ground lug installed for termination of the green ground conductor.

M. Telephone Terminal Boards: Provide a #6 cu. ground in 3/4" c. from each board to the main service disconnect ground bus.

3.3 CONDUCTIVE PIPING:

A. Bond all conductive piping systems in the building to the electrical system ground. Bonding connections shall be made as close as practical to the water pipe ground or service equipment ground bus.

3.4 GROUNDING RESISTANCE:

A. Grounding system ground resistance must not exceed 5 ohms. Final tests shall assure that this requirement is met. Submit to the Engineer.

B. Where permanent ground connections are required, make the connections by the exothermic process to form solid metal joints.

C. Where rock prevents the driving of vertical ground rods, install grounding electrodes in horizontal trenches to achieve the specified resistance.

D. Where more than one ground rod is required to meet the specified resistance, they shall be located at least 10 feet apart.

END OF SECTION

SECTION 260533 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section includes the furnishing, installation, and connection of raceways, fittings, and boxes to form complete, coordinated, grounded raceway systems. Raceways are required for all wiring unless shown or specified otherwise.

B. Definitions: The terms ‘conduit’ or ‘raceway’, as used in this specification or on the drawings, shall mean any or all of the raceway types specified. The term ‘surface metal raceway’, as used in this specification or on the drawings, shall refer to raceway types specified in 2.1-K.

PART 2 - PRODUCTS

2.1 MATERIAL:

A. Raceway Size: In accordance with the NEC but not less than 1/2-inch unless otherwise noted in other sections of the Specifications.

B. Raceways: Install raceway types as shown on drawings and as listed below. No other raceway systems other than listed below will be allowed. All conduit sizes listed on the drawings are based on conductor fill in EMT conduit. If other conduit types are used, adjust conduit sizes to conform with NEC Chapter 9, Table 4.

1. Rigid steel: UL 6. Rigid intermediate steel conduit (IMC): UL 1242. Rigid conduit (GRC) and intermediate metal conduits (IMC) shall be standard size, hot dip galvanized steel conduit, minimum 1/2" trade size, as manufactured by Wheatland Tube, Triangle PWC, Inc., Allied, or equal. Rigid conduit and IMC shall be provided with threaded fittings and couplings. In trade sizes 2-1/2" to 4", contractor may use Allied 'Kwik-Couple' fittings in lieu of individual steel couplings. Where 'Kwik-Couple' fittings are used exterior for vertical risers, install fitting with taper end up. A "green" ground wire, sized per NEC 250-122, shall be installed in all conduits containing phase conductors. All conduit exposed exterior of building, in wet locations or subject to physical abuse shall be Rigid Steel or IMC.
2. Electrical Metallic Tubing (EMT): U.L. 797. EMT (thinwall conduit) shall be minimum 1/2" trade size, as manufactured by Wheatland Tube, Triangle PWC, Inc., Allied, or equal. Provide EMT with Thomas and Betts, or equal, U.L. listed steel or die-cast type fittings. Indenter type fittings shall not be used. Contractor may use Allied 'Kwik-Fit' fittings in lieu of individual fittings. A "green" ground wire, sized per NEC 250-122, shall be installed in all conduits containing phase conductors. EMT conduit shall not be installed in earth, in wet locations, exposed exterior to the building, subject to physical abuse, or below grade.
3. Flexible steel conduit: Fed. Spec. WW-C-566 and UL 1. Short runs (6' or less) of galvanized steel or liquid tight steel flexible conduit (flexible steel tubing covered with extruded liquid-tight jacket of polyvinyl chloride) may be used when approved by the

Engineer. (Minimum 1/2" trade size.) A separate "green" ground conductor (sized per N.E.C.) shall be installed in all flexible conduits. Type AC "Armored Cable", Type MC "Metal-clad Cable", or "BX" cable shall not be used in any manor unless supplied as part of a manufactured flexible wiring system for lighting and approved by the Engineer in writing.

4. U.L. approved schedule 40 P.V.C. conduit may only be used where conduits are to be run in earth or below slabs. PVC conduits shall not be used in patient care areas (other than patient sleeping areas) above or below grade. (NEC Article 517.13 (A), 517.10 (B) (2)). These locations shall have branch circuit wiring installed in a metal raceway system, or a cable having a metallic armor or sheath assembly. P.V.C. conduits shall not be used above grade inside or outside of the building, unless specifically noted otherwise on the drawings. Use G.R.S. ells and risers, both horizontal and vertical, unless specifically noted otherwise on the drawings. Use conduit adapters when converting from P.V.C. to steel conduit. Branch circuit and feeder P.V.C. conduit to be 3/4" min. Concrete encase all conduit installed below grade where so noted on the drawings, (U.L. approved schedule 40 P.V.C. with plastic spacers). All P.V.C. conduit shall be provided with a separate "green" ground conductor, sized per N.E.C.

C. Conduit Fittings:
   1. Rigid steel and IMC conduit fittings:
      a. Standard threaded couplings, locknuts, bushings, and elbows: Fed. Spec. W-F-408, except only material of steel or malleable iron are acceptable. Integral retractable type IMC couplings are acceptable also.
      b. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.
      c. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted. Bushings for conduit smaller than 1-1/4-inch shall have flared bottom with ribbed sides.
      d. Erickson (union-type) and set screw type couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
      e. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.
      f. In trade sizes 2-1/2 inches to 4-inches for rigid steel raceway or intermediate metal raceway, contractor may use Allied 'Kwik-Couple' fittings in lieu of individual steel couplings. 'Kwik-Couple' fittings shall not be used in hazardous locations. Where 'Kwik-Couple' fittings are used exterior for vertical risers, install fitting with taper end up.
      g. Where conduits enter boxes, they shall be rigidly clamped to the box by double locknuts and bushings. Conduit shall enter the box squarely. Bushings and locknuts shall be made of malleable iron and shall have sharp clean-cut threads.
   2. Electrical metallic tubing fittings:
      a. Fed. Spec. W-F-408, except only material of steel for compression type. Steel or die-cast is acceptable for set screw type. Die-cast compression is not acceptable.
      b. Couplings and connectors: Suitable for the installation. Use gland and ring compression type or set screw type couplings and connectors. Use concrete tight

where installed in concrete. Set screw type couplings for conduit 2 inches and larger shall have four set screws each. Use set screws of case-hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.

c. Indenter type connectors or couplings are prohibited.

3. Flexible steel conduit fittings:
   a. Fed. Spec. W-F-406 and UL 5, except only steel or malleable iron material is acceptable.
   b. Clamp type, with insulated throat.
4. Liquid-tight flexible metal conduit fittings:
   a. Fed. Spec. W-F-406, except only steel or malleable iron material is acceptable.
   b. Type incorporating a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening. Connectors shall have insulated throats.
5. Expansion and deflection couplings:
   a. UL 467 and UL 514.
   b. Accommodate, 1.9 cm (0.75") deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
   c. Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL 467, and the NEC code tables for ground conductors.
   d. Shall be watertight, seismically qualified, corrosion-resistant, threaded for and compatible with rigid or intermediate metal conduit.
   e. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material with stainless steel jacket clamps.

D. Raceway Supports:
1. Parts and hardware: Zinc-coat or provide equivalent corrosion protection.
2. Pipe Straps: Fed. Spec. FF-S-760, Type I, Style A or B.
3. Individual Raceway Hangers: Designed for the purpose, having a pre-assembled closure bolt and nut, and provisions for receiving a hanger rod.
4. Multiple Raceway (trapeze) hangers: Not less than 1-1/2 by 1-1/2 inch, 12 gauge steel, cold formed, lipped channels; with not less than 3/8-inch diameter steel hanger rods.
5. Solid Masonry and Concrete Anchors: Fed. Spec. FF-S-325; Group III self-drilling expansion shields, or machine bolt expansion anchors Group II, Type 2 or 4, or Group VIII.

E. Outlet Boxes:
1. UL-50, UL514A, Fed. Spec. W-C-586 and Fed. Spec. W-J-800.
2. Cast metal where required by the NEC or shown, and equipped with rustproof boxes.
3. Sheet metal boxes: 4-inch square, galvanized steel, except where otherwise shown. Single gang 'Handy Boxes' will not be allowed.
4. Boxes installed in concrete or masonry and boxes larger than two gang shall be masonry type.

F. Wireways: Equip with hinged covers, except where removable covers are shown. All exterior wireways NEMA 3R. Size all wireways per National Electrical Code.

G. Pull and Junction Boxes:
1. Pull and junction boxes shall be code gauge steel boxes with hinged, bolted or screwed covers. Boxes shall be flush or surface mounted as shown or required by N.E.C and job conditions.

2. Junction and pull box shall be installed where shown on drawings and additional boxes shall be installed if required for pulling of wire provided location and installation is approved by the Architect. All boxes shall be code construction and size with screw type cover and shall be installed in accessible locations.
3. Conductors shall not be spliced within pull boxes.
4. Boxes shall be rated as shown on the drawings or as required by applicable codes, ie: raintight, weatherproof, explosionproof, etc.

H. Floor Boxes:

1. Verify exact location of all floor boxes with the architect prior to rough-in. All floor boxes shall conform to UL 514A and UL 514C scrub-water testing standards. Unless otherwise specified on the drawings or in the special outlet schedule, floor boxes shall be as follows, or equal by Walker/Wiremold:
   a. Fully adjustable, stamped steel, concrete tight with knockouts on bottom and all four sides (1/2", 3/4" and 1" sizes) shall be Steel City #68-D or Hubbell #B-2527 deep when concrete floor thickness above any part of deck is 4-inch thick or more; and Steel City #68-S or Hubbell #2529 shallow when concrete floor thickness is 3-inch up to 4-inch.
   b. Cover plates shall be polished brass. Steel City #P60-DS or Hubbell #S3925 hinged lift L105 for duplex receptacles, Steel City #P60 or Hubbell #S Series for single receptacles with removable plug sized to match the receptacle to be installed, and Steel City #P60-3/4-2 or Hubbell #S-88-1 for telephone, TV, microphone, and furniture feed floor boxes. Route liqutite conduit from furniture feed floor box to furniture.
   c. Provide polished brass carpet flanges in all carpeted areas: Steel City #P60-CP or Hubbell #S-3082.
   d. PVC floor boxes may be used in lieu of floor boxes indicated above. PVC floor boxes shall be equal to Walker, Wiremold, Hubbell, Carlon, with metal covers. Receptacle covers shall be double flap, telephone and data covers shall be combination 2”/1/2” inserts. Unless noted otherwise on the drawings, all floor boxes for similar devices shall be either metal or PVC, no intermixing of same types of floor boxes will be allowed.
2. Multi-gang floor boxes shall be fully adjustable, cast iron, watertight use deep type in floors 4-inch or thicker and use shallow type in floors 2 1/2-inch to 4-inch thick. All multi-gang floor boxes shall conform to UL 514A and UL 514C scrub-water testing standards. Provide barriers between line and low voltage compartments of multi-gang floor boxes.

   Multi-gang floor boxes: (or equal by Walker/Wiremold)

STEEL CITY	Single	Double	Triple
Deep Floor Box	641	642	643
Shallow Floor Box	841 SC	842 SC	843 SC
Carpet Flange	P64-CP	P64-2G-CP	P64-3G-CP
HUBBELL	Single	Double	Triple
Deep Floor Box	B-2436	B-4233	B-4333
Shallow Floor Box	B-2414	B-4214	B-4314

Carpet Flange	SB-3083	SB-3084	SB-3085

Cover plates shall be polished brass Steel City #P64-DS or Hubbell #S3825 for duplex receptacles, Steel City #P64 or Hubbell #S Series for single receptacles with removable plug sized to match the receptacle to be installed; and Steel City #P64-3/4-2 or Hubbell S-2425 for telephone, TV, microphone, and other systems floor boxes.

I. Poke Through Outlets: Verify exact location with Architect prior to rough in. Poke through outlets shall be UL Listed for 2 hour fire rating. All poke-through outlets shall conform to UL 514A and UL 514C scrub-water testing standards.
   1. Flush Type: Provide with 20A., 120 volt duplex receptacle or 20A. 120 volt duplex isolated ground receptacle as shown on the drawings, per the specification. Walker RC3A20BS Series, or equal by Hubbell. Verify flange and slide color with Architect.
   2. Flush furniture feed: Walker RC7006ABR Series, or equal by Hubbell, with liquitite conduit connection to furniture. Verify flange and conduit adaptor assembly color with Architect.

J. Concealed Service Floor Box: Verify exact location with architect prior to rough-in. All concealed service floor boxes shall conform to UL 514A and UL 514C scrub-water testing standards.
   1. Multiple service type with no exposed service fittings. Provide with receptacle, telephone, and data outlets as shown in the Special Outlet Schedule. Verify color with the Architect. Unless otherwise noted in the Special Outlet Schedule, provide Walker RFB4 Series with receptacle, data, and telephone brackets as required and S36CCTC Series recessed activation cover, or equal by Hubbell or Steel City.

K. Surface Metallic Raceway:
   1. Only metallic surface raceways shall be used unless specifically noted otherwise on the Drawings.
   2. Surface metallic raceway and associated outlet boxes shall only be used where shown on the drawings and in remodels and modifications to existing where existing wall and ceiling voids do not permit concealed installation, but shall not be used at any other location unless shown otherwise on the drawings. All outlet box and surface metallic raceway locations must first be approved and coordinated with the Architect. All surface raceway and outlets must be painted to match the surface it is attached to. Use outlet boxes and fittings by the same manufacturer and approved for use with the raceway. Install an equipment grounding conductor sized per NEC Article “Grounding” for the largest circuit in the raceway if not already specified.
   3. Raceways shall be Wiremold #V500 minimum or #V700 for small sizes and Wiremold Series 2000, 3000, and 4000 for larger capacities, unless noted otherwise on the drawings. In all cases, do not exceed the fill per the manufacturers published data. Surface metallic raceways shall be sized to match the conduit sizes indicated on the drawings, or as required by Code. For telephone, data, video, or CATV outlet boxes, use Wiremold V700 series minimum.
   4. Surface metallic raceways shall be provided with all mounting hardware, covers, fittings, outlet boxes, elbows, tees, etc. as required for a complete system.

PART 3 - EXECUTION

3.1 RACEWAY:

A. An equipment grounding conductor, sized per NEC Article “Grounding”, shall be installed in all conduits containing phase conductor(s).

B. Rigid galvanized steel (GRC) or IMC must be used at all times when exposed to weather or physical abuse and in all NEC classified hazardous locations. EMT may not be used in direct contact with earth, or in concrete slabs on grade.

C. U.L. approved Schedule 40 P.V.C. conduit may be used where feeders or branch circuits are to be run in earth or slabs (3/4" minimum), except as noted otherwise in 2.1-B-4. Use GRC ells and riser, both horizontal and vertical. All conduit risers through concrete floors shall be GRC from below the top of the floor slab. Use conduit adapters when converting from P.V.C. to steel conduit. Use plastic spacers when more than one conduit is installed together. Spacers shall be installed per NEC Article “Rigid Nonmetallic Conduit”. See Drawings for areas requiring concrete encasement. All P.V.C. conduits shall be provided with separate ground conductor sized per N.E.C.

3.2 PENETRATIONS:

A. Cutting or Holes:
   1. Locate holes in advance where they are proposed in the structural sections such as ribs or beams. Obtain the approval of the Structural Engineer prior to drilling through structural sections.
   2. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the Structural Engineer as required by limited working space.
   3. All patching shall be done in a neat and workman-like manner, meeting with the approval of the Architect, by mechanics of the particular trade involved.

B. Fire Stop:
   1. Where conduits, wireways, and other electrical raceways pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases, and maintains specified fire rating. Completely fill and seal clearances between raceways and openings with the fire stop material.

C. Fire Barrier Penetration Seals:
   1. Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following:
      a. 3M fire Barrier Caulk, Putty, or Strip Sheet
      b. Carborundum Fiberfrax Fyre Putty
      c. Tremco X-ferno Fire Products
      d. Rectorseal Metacalk
   2. Provide seals for any opening through fire-rated walls, floors or ceilings used as passage for components such as conduits or cables.

3. Cracks, voids or holes up to 4-inch diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat and UL-listed.
4. Openings greater than 4-inch diameter and raceway sleeves through floors at telephone terminal boards: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 degrees to 350 degrees F (121 to 177·C), that is UL-listed. KBS "Sealbags" manufactured by P-W Industries will be acceptable.
5. Execution: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions. All fire barrier seals shall meet the rating of the wall.

D. Waterproofing:
1. At floor, exterior wall, and roof conduit penetrations, completely seal clearances around the conduit and make watertight.
2. Any penetrations through roof shall be made with “Stoneman” flashing connections as manufactured by Stoneman Engineering and Manufacturing Co., Inglewood, California, and any penetrations made in exterior or basement foundation walls shall be sealed with Thunderline “Link-seal” connections, as manufactured by Thunderline Corporation, Wayne, Michigan.

3.3 CONDUIT SYSTEMS INSTALLATION, GENERAL:

A. Installation: In accordance with UL, NEC, as shown, and as hereinafter specified.

B. Essential (Emergency) raceway systems: Install entirely independent of other raceway systems. Common supports and hangers may be used.

C. Raceway Burial Depths: (Underground work)
1. 30 inch minimum cover to grade or bottom of floor slab.
2. 36 inch minimum cover to grade from top of conduit for secondary services. (Unless otherwise required by Utility Co.) Use minimum 24" radius bends.
3. 4 inch below concrete slab inside a building.
4. 48 inch minimum cover to grade from bottom of conduit for primary services. (Unless otherwise required by Utility Co.) Use minimum 36" radius bends.

D. Install raceways as follows:
1. In complete runs before pulling in cables or wires.
2. Flattened, dented, or deformed raceways is not permitted. Remove and replace the damaged raceways with new undamaged material.
3. Assure raceway installation does not encroach into the ceiling height head room, walkways, or doorways.
4. Cut square with a hacksaw, ream, remove burrs, and draw up tight.
5. Mechanically and electrically continuous.
6. Independently support raceway. Do not use other supports i.e., (suspended ceilings, suspended ceiling supporting members, lighting fixtures, mechanical piping, or mechanical ducts.). Group raceways with common supports where possible. Conduit shall be supported within 12-inches of connectors.

7. Close ends of empty raceway with plugs or caps at the rough-in stage to prevent entry of debris, until wires are pulled in, or at locations where conduits are stubbed out below grade outside of building.
8. Raceway installations under fume and vent hoods are prohibited.
9. Secure raceways to cabinets, junction boxes, pull boxes and outlet boxes with bonding type locknuts. For GRC and IMC raceway installations, provide a locknut on the inside of the enclosure, made up wrench tight. Do not make raceway connections to junction box covers.
10. Raceways shall not be used as a support for other raceways or cables.
11. Where conduit sizes are not specifically indicated, provide sizes in accordance with the requirements of the N.E.C.
12. Conduit to be installed to the requirements of structure and to the requirements of all other work on the project. Conduit shall be installed to clear all openings, depressions, pipes, ducts, reinforcing steel, etc. Conduit set in forms for concrete structure shall be installed in such a manner that installation will not affect the strength of the structure. Coordinate installation with Structural Engineer for conduits rising up from floor slabs into bottom of panelboards. Minimum distance between conduits shall be 6". Maximum size of conduit permitted in concrete slabs, if so approved by the Architect, is 1" trade size.
13. Conduit shall be installed continuous between connections to outlets, boxes and cabinets with a minimum possible number of bends and not more than the equivalent of 4-90 degree bends between J-box connections. Bends shall be smooth and even and shall be made without flattening conduit or flaking enamel. Radius of bends shall be as long as possible and never shorter than the corresponding trade elbow. Long radius elbows shall be used where necessary.
14. Conduits shall be securely fastened in place with approved straps, hangers, and steel supports as required by the National Electrical Code. All surface mounted conduits on walls below eight foot above grade shall be secured with conduit straps, no clamps. The use of wire, plumbers straps, etc, will not be permitted.
15. Junction and pull boxes shall be installed where shown on drawings and additional boxes shall be installed if required for pulling of wire, provided location and installation is approved by the Architect. All boxes shall be code gauge construction with screw type covers and shall be installed in accessible locations.
16. Conduit shall be reamed and thoroughly cleaned before installation and kept clean after installation. Openings shall be plugged and boxes shall be covered as required to keep conduit clean during construction. All conduit shall be fished clear of obstructions before the pulling of wires. All conduit shall be as sized above and shall not be smaller than N.E.C. listed minimum requirements.
17. All work shall be protected against damage during construction and any work damaged or moved out of line after roughing-in shall be repaired and reset to the approval of the Architect without additional cost to the Owner.
18. Conduit terminations at panelboards, switchboards, motor control equipment, junction boxes, etc., shall be aligned and installed true and plumb. Wood or steel bucks or templates shall be used where required. This work shall also include all steel supports as required for mounting of electrical equipment excepting only where steel supports are specified to be furnished under another specification heading.
19. Where conduits cross construction expansion joints, Contractor shall provide Appleton XJ or equal expansion couplings with copper bonding jumpers.
20. Where conduits are installed in concrete, all connectors and couplings shall be water tight or rated for direct burial in concrete.

21. Mechanical equipment service clearances and electrical apparatus service clearances as specified in their respective manufacturer's product data shall be maintained free from conduit obstructions.
22. Raceways shall not be routed through mechanical ductwork.
23. Route all surface metallic raceways for receptacle, telephone, data and all other wall outlet boxes horizontal at base of wall to nearest corner or door trim before rising vertically up wall. Locate all boxes for devices near doors as near as possible to door trim and rise surface metallic raceway up wall adjacent to door trim. Any surface metal raceways routed down walls into existing floors shall be installed tight to existing walls into the existing floor. If this can not be accomplished because of existing conditions, the surface metal raceways shall be routed to or into the ceiling of the room.

E. Raceway Bends:
1. Make bends with standard raceway bending machines.
2. Raceway hickey may be used for slight offsets, and for straightening stubbed out raceways.
3. Bending of raceways with a pipe tee or vise is prohibited.

3.4 CONCEALED WORK INSTALLATION:

A. General:
1. Raceway and Outlet Boxes Installation: All raceway systems work and outlet boxes shall be installed concealed in walls, floor and roof construction or concealed within furred spaces or above ceilings. In equipment or mechanical rooms exposed work shall include feeders and connections to equipment unless noted otherwise.

B. In Concrete:
1. Raceway: GRC, IMC, EMT, or PVC; except do not install EMT in concrete slabs that are in contact with soil, gravel or vapor barriers.
2. Align and run raceways in direct lines (parallel and perpendicular).
3. Install raceways through concrete beams only when the following occurs:
   a. Where shown on the structural drawings.
   b. As approved by the Structural Engineer prior to construction, and after submittal of drawing showing location, size, and position of each penetration.
4. Installation of raceways in concrete that is less than three inches thick is prohibited. All raceways installed in concrete shall be approved by the Structural Engineer.
   a. Raceway outside diameter larger than one-third of the slab thickness is prohibited.
   b. Space between raceways in slabs: Approximately six conduit diameters apart, except one conduit diameter at conduit crossings.
   c. Install raceways approximately in the center of the slab so that there will be a minimum of 3/4-inch of concrete around the raceways.
5. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to insure low resistance ground continuity through the raceways. Tightening set screws with pliers is prohibited.

C. Above Furred or Suspended Ceilings and in Walls:
1. Raceways for conductors 600 volts and below:
   a. GRC, IMC, or EMT. Types mixed indiscriminately in the same system is prohibited.
2. Raceways for conductors above 600 volts:

a. GRC.

3. Align and run raceways parallel or perpendicular to the building lines.
4. Connect recessed or lay-in lighting fixtures and all other devices installed in a lay-in ceiling to raceway runs with flexible metal conduit extending from a junction box to the fixture. Provide a ground wire in all flexible conduits.
5. Tightening set screws with pliers is prohibited.

3.5 EXPOSED WORK INSTALLATION:

A. Exposed work only where permitted by the Architect.

B. Raceways for Conductors 600 volts and below:
1. GRC, IMC, or EMT types mixed indiscriminately in the system is prohibited.
2. All raceways exposed to physical abuse and in all industrial pump and treatment plant locations shall be GRC or IMC.
3. All wiring located in the fire pump rooms shall be in IMC conduit.

C. Raceways for conductors above 600 volts:
1. GRC

D. Align and run raceways parallel or perpendicular to the building lines.

E. Install horizontal runs close to the ceiling or beams and secure with raceway straps.

F. Surface metal raceways: Use only where approved and coordinated with Architect.

G. Painting:
1. Paint exposed raceways as specified in Section, PAINTING. All conduit in exposed architecturally areas shall be painted to match finish color selected by architect.

3.6 WET OR DAMP LOCATIONS:

A. Unless otherwise shown, use raceways of GRC or IMC above grade. Use PVC conduit below grade, except rigid galvanized steel ells and risers shall be used.

B. Provide sealing fittings, to prevent passage of water vapor, where raceways pass from warm to cold locations, i.e., (refrigerated spaces, constant temperature rooms, air conditioned spaces) or similar spaces.

3.7 MOTORS AND VIBRATING EQUIPMENT:

A. Use liquid-tight Type UA flexible metal conduit for connections to motors and other electrical equipment subject to movement, vibration, misalignment, cramped quarters, or noise transmission. Provide liquid-tight flexible metal conduit for installation in exterior locations, moisture or humidity laden atmosphere, corrosive atmosphere, water or spray wash-down operations, and locations subject to seepage or dripping of oil, grease or water. Provide a green ground wire with flexible metal conduit.

3.8 RACEWAY SUPPORTS, INSTALLATION:

A. All raceways shall have supports at maximum spacing of 10-feet and within 3-feet of a fitting, elbow, box outlet or enclosure. Safe working load shall not exceed 1/4 of proof test load of fastening devices. This shall apply to both vertical and horizontal conduit runs.

B. Use pipe straps or individual raceway hangers for supporting individual conduits.

C. Support multiple raceway runs with trapeze hangers. Use trapeze hangers that are designed to support a load equal to or greater than the sum of the weights of the raceways, wires, hanger itself, and 200 pounds. Attach each raceway with U-bolts or other approved fasteners.

D. Support raceways independently of junction boxes, pull boxes, fixtures, suspended ceiling T-bars, angle supports, and similar items. Do not support raceways from mechanical piping or ductwork.

E. Fasteners and Supports in Solid Masonry and Concrete:
   1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
   2. Existing Construction:
      a. Steel expansion anchors not less than 1/4-inch bolt size and not less than 1-1/8 inch embedment.
      b. Power set fasteners not less than 1/4-inch diameter with depth of penetration not less than 3-inches.
      c. Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.

F. Hollow Masonry: Toggle bolts are permitted. Bolts supported only by plaster are not acceptable.

G. Metal Structures: Use machine screw fasteners or other devices specifically designed and approved for the application.

H. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.

I. Chair, wire, or perforated strap shall not be used to support or fasten conduit.

J. Spring steel type supports "caddy clips" that are listed for the intended use are acceptable in appropriate locations.

K. Vertical Supports: Vertical raceway runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

3.9 BOX INSTALLATION:

A. Boxes for Concealed Raceways:
   1. All outlet boxes shall be flush mounted unless noted otherwise on the drawings or herein. Boxes installed in gyp board or plaster finish shall have code gauge galvanized raised

covers set to not more than 1/4" behind final finish in non-combustible walls or ceilings, and flush with the wall or ceiling finish in combustible walls or ceilings. Covers shall be selected with proper openings for devices installed in box.

2. Mount flush. Boxes protruding from the finished wall or ceiling surface; recessed with more than 1/4-inch gap between the wall or ceiling surface and the box in non-combustible walls or ceilings; or not flush with the wall or ceiling surface in combustible walls or ceilings will be changed out with all wall or ceiling reconstruction expense paid by the Electrical Contractor.
3. Provide raised covers for boxes to suit the wall or ceiling construction and finish.

B. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling in operations.

C. Remove only knockouts as required and plug unused openings. Use threaded plugs for cast metal boxes and snap-in metal covers for sheet metal boxes.

D. Outlet boxes in the same wall mounted back-to-back are prohibited.

E. Minimum size of outlet boxes for ground fault interrupter (GFI) receptacles is 4-inches square by 2-1/8 inches deep, with device covers for the wall material and thickness involved.

F. Where lighting fixtures and appliance outlets are to be mounted in concrete or in plaster finish on concrete, outlet boxes shall be installed in forms at exact dimensions from bench marks, columns, walls or floors.

G. Where lighting fixtures and appliances outlets are to be mounted on masonry walls and/or plastered furring or other finish, outlet boxes shall be roughed in to general location before installation of wall and furring and shall be reset to exact dimensions before walls and furring are constructed.

H. All outlet boxes shall be set true to horizontal and vertical lines parallel to walls, floors and ceilings and true to finish lines. All boxes shall be secured to ceilings or walls so all installations are solidly mounted.

I. Boxes mounted to metal studs shall be mounted with Caddy #MSF metal stud clip, or equal as approved by the Engineer. Boxes mounted to either metal or wood studs shall be mounted with Caddy #7666 farside box support, or equal as approved by the Engineer. Single metal stud box clips without box supports are not acceptable for mounting boxes.

J. Boxes for exterior or wet location exposed work (where approved by the engineer) shall be Appleton or Pyle National Type FS or FSC for shallow devices and Type FD or FDC for deep devices. Boxes for ceiling mounted light fixtures shall have approved no-bolt fixture studs. Boxes used as junction boxes shall have beveled edge flat steel blank cover.

K. Where outlet boxes are mounted exposed in unfinished areas, (where approved by the engineer) surface mounted boxes shall be 4-inches square, have rounded corners and 1/2-inch raised steel cover plates.

L. Location of outlets on small drawings is approximate and exact dimensions for locations of outlets shall be as taken from large scale plans and details on drawings or as directed by the Architect/Engineer. Outlets shall be located generally from column centers and finished wall

lines or to center of wall or joints between wall panels. Ceiling outlets shall be installed at elevation of suspended ceiling connected to outlets in ceiling or slab above. Where necessary to fit and center with panel or ceilings and wall spaces, the contractor must, at no expense the Owner, shift the lighting outlets or other outlets as required by the Architect.

M. Bracket lights over mirrors shall be centered on mirrors with 2-inch fixture clearance above mirror.

N. Boxes for switches and receptacles installed in columns shall be located off center to allow for future partitions.

O. Boxes for switches at or near door shall be installed on the side opposite the hinge. Verify door swing direction prior to rough-in.

P. To prevent sound from traveling through walls, electrical devices from different rooms shall not be mounted in the same stud place. Through-wall boxes shall not be used. In fire rated walls or partitions, outlet boxes on opposite sides of walls or partitions shall be separated by a horizontal distance of 24-inches. Outlet boxes larger than 4-inch square shall not be installed in fire rated walls or partitions, unless contractor provides fire barrier pads around outlet boxes to maintain fire rating of walls or partitions. Verify location of fire rated walls or partitions with Architectural drawings prior to rough-in.

Q. Mark all junction boxes and pull boxes with panel, circuit number, and voltage.

R. All floor boxes shall be cleaned of all construction debris and dirt.

S. Where fire rated 'poke-through' devices are specified, Contractor shall install devices after concrete pour and after final verification of location with Owner. Fire rated ‘poke-through’ devices shall be spaced apart from each other as required by the manufacturer and U.L.

T. Sectional boxes shall not be used except where directed and approved by the Architect for installation in non-plastered tile walls and provided conduit connections are installed concealed in walls.

U. Install all outlets in a secure and substantial manner and locate so as to be compatible with space, construction and equipment requirements and with the work of the other trades.

V. Furnish and install plaster rings for all boxes installed in plastered (or gyp board) ceilings and walls. Verify construction with general construction drawings.

W. Boxes for switches at or near doors shall be installed on the side opposite the hinge and within 6” of the door. Verify door swing direction prior to rough-in.

X. Rough-in outlets for electric water coolers so as to be concealed behind coolers, but remain accessible, in accordance with recommendation of equipment supplier.

Y. Provide blank cover plates for all outlet boxes not used. Plates in finished areas shall match those specified for switch and receptacle devices. Blank cover plates for junction boxes supplied from the emergency system or fire alarm system shall be painted red.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section includes the furnishing, installation and connection of panelboards.

1.2 SUBMITTALS:

A. Submit product data and shop drawings in accordance with Division 01 and Division 26 Sections “Common Work Results for Electrical” for products specified under Part 2 - PRODUCTS.

B. Product Data: For each type of panelboard, overcurrent protection device, accessory, and related component, include the following:
   1. Manufacturers’ technical data on features, performance, electrical characteristics, ratings, and finishes.
   2. Rated capacities, features, operating characteristics, furnished specialties, factory settings, accessories, and time-current characteristic curves for individual relays and overcurrent protective devices.
      a. Time-current curves for each type of overcurrent protection device. Include hard copy of characteristic curve and TCC Number for use with Power Tools by SKM Systems Analysis, Inc. Indicate available setting points and selectable ranges for each type of adjustable overcurrent protection device.

C. Shop Drawings: For each panelboard and related equipment, include the following:
   1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show method of field assembly and location and size for each field connection. Include the following:
      a. Tabulation of installed devices with features and ratings.
      b. Enclosure types and details.
      c. Outline and general arrangement drawing showing dimensions, shipping sections, and weights of each assembled section.
      d. Bus configuration with size and number of conductors in each bus run, including phase, neutral, and ground conductors of main and branch buses.
      e. One-line diagram.
      f. Bus current and voltage ratings.
      g. Short-time and short-circuit current rating of equipment assembly.
      h. Feeder entry locations and lug configuration.
      i. Elevation drawing showing locations for anchor bolts**.**
      j. Nameplate legends.
   2. Wiring Diagrams: For each type of panelboard and related equipment, include the following:
      a. Power, signal, and control wiring.

D. Coordination Drawings: Submit Coordination Drawings in accordance with Division 26 Section "Common Work Results for Electrical" for each location where panelboards are included in the Work.

E. Panelboard Directories: For installation in panelboard.

F. Field quality-control Test Method and Procedure: List of procedures to be used during functional and operations sequence testing. Method of Procedure should include but not be limited to the following:
1. Tabulation of Testing Equipment and PPE required for tests.
2. Schedule of Shutdowns required.
3. Manufacturer's Recommended Pre-Start Checklists for the following:
   a. Overcurrent Protection Devices
4. Step-by-Step Testing Operations and Criteria for tests listed in Part 3 Paragraph "Field quality-control".

G. Field quality-control test reports including the following:
1. Test results that comply with requirements.
2. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

H. Operation and Maintenance Data: For electrical equipment, accessories and components to be included in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Manufacturer's routine maintenance requirements for panelboard and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current curves, including selectable ranges for each type of relay and overcurrent protective device. Include directory listing each adjustable breaker included in the Work and their final set points.
4. Manufacturer's sample system checklists and log sheets.

PART 2 - PRODUCTS

2.1 PANELBOARDS:

A. Panelboards shall be in accordance with UL, NEMA, NEC, and as shown on the drawings. Panelboards shall be by the same manufacturer as the remainder of the distribution equipment on the project. No mixing of manufacturers on the project. Approved manufacturers shall be as follows:

Panelboard Type	Square 'D'	Siemens ITE	General Electric	Cutler-Hammer
Branch Circuit Panelboard 240V	NQ	P1	AL/AQ	PRL1X
Branch Circuit Panelboard 480V	NF	P1	AE	PRL2X

Circuit Breaker Distribution Panelboard	I-Line	P5	Spectra	PRL3X
Fusible Distribution Panelboard	QMB	P5	QMR	PRL4F

B. Branch circuit and distribution panelboards rated up to 240V (400A. max) shall have a short circuit current rating tested to U.L. Standards for a minimum rating of 10,000 A.I.C. unless noted otherwise. Breaker rating with-in panel shall be equal to or greater than minimum integrated equipment rating. Series ratings will not be accepted, unless specifically noted otherwise on the drawings. All breakers shall be of either the plug-in type or bolt-on type.

C. Branch circuit and distribution panelboards rated over 240V and up to 480V (400A max) shall have a short circuit current rating tested to U.L. Standards for a minimum rating of 14,000 A.I.C. unless noted otherwise. Breaker rating with-in panel shall be equal to or greater than minimum integrated equipment rating. Series ratings will not be accepted, unless specifically noted otherwise on the drawings. All breakers shall be of the bolt-on type only.

D. Distribution panelboards located in finished rooms (other than mechanical, electrical or janitor rooms) shall be provided with key locking doors.

E. Provide standard manufactured products. All components of panelboards shall be the product and assembly of the same manufacturer. All similar units of all panelboards to be of the same manufacturer.

F. All panels shall be dead front safety type. Arrange sections for easy removal without disturbing other sections. All distribution panels in finished areas shall be provided with key locking doors. All panels in finished areas shall be recessed with flush type covers.

G. All panelboards shall be completely factory assembled with molded case circuit breakers or switches.

H. Panels shall have main breaker/switch or main lugs, bus size, voltage, phase, top or bottom feed, and flush or surface mounting as scheduled on the drawings.

I. Panelboards shall have the following features:
   1. Non-reduced size tin plated copper bus bars (phase and neutral), and copper connection straps bolted together and rigidly supported on molded insulators. Bus bar tops for panels with single pole branches shall be arranged for sequence phasing of branch circuit devices. All lugs shall be AL/CU rated.
   2. Full size neutral bar shall be mounted on insulated supports. Provide 200% neutral bar for panels fed from K-rated transformer or as shown on drawings. Minimum number of lugs shall be equal to 90% of number of pole spaces in the panelboard, except in computer rated panelboards or isolated ground panelboards provide 100% of pole space lugs. Each neutral conductor shall be terminated under a separate lug.
   3. Copper ground bar with sufficient terminals for all grounding wires. Minimum number of lugs shall be equal to 90% of number of pole spaces in the panelboard, except in computer rated panelboards or isolated ground panelboards provide 100% of pole space lugs. Each ground conductor shall be terminated under a separate lug.

4. Distribution panels located in finished rooms (other than mechanical, electrical rooms or janitor rooms) shall be provided with key locking doors.
5. All breakers and phase bus connections shall be arranged so that it will be possible to substitute a 2-pole breaker for two single pole breakers, and a 3-pole breaker for three single pole breakers, when trip is 100 amps or less without having to drill and tap the main bus bars at bus straps.
6. Design interior so that protective devices can be replaced without removing adjacent units, main bus connectors, and without drilling or tapping. Panel phase bus connections to protective devices shall not be riveted to the panel bus and shall be field removable by means of a screw driver.
7. Where designated on panel schedule as "space", include all necessary bussing, device support, and connections. Provide blank cover for each space.
8. In two section panelboards, the main bus in each section shall be full size. The first section shall be furnished with subfeed lugs on the line side or feed through lugs on the load side with cable connections to the second section. Panelboard sections with tapped bus or crossover bus shall not be accepted.
9. Electrical Contractor shall coordinate lug quantities with the number of feeder conductors serving panelboard.
10. All panelboards serving devices having isolated ground circuits shall be provided with an additional insulated copper ground bus for connection of isolated ground conductors.

2.2 CABINETS AND TRIMS:

A. Cabinets:
1. Provide galvanized steel cabinets to house panelboards. Cabinets for distribution panels may be factory primed and suitable treated with a corrosion-resisting paint finish meeting UL standard for outdoor applications.
2. Cabinet enclosure shall not have ventilating openings (225A. and less).
3. Back and sides shall be of one piece formed steel. Cabinets for distribution panels may be of formed sheet steel with end and side panels welded, riveted, or bolted as required.
4. Provide minimum of four interior mounted studs and necessary hardware for "in" and "out" adjustment of panel interior.
5. Flush mounted cabinets for two section panelboards shall have both sections bolted together, arranged side by side, shall be the same height and should be 1-1/2 inches apart and coupled by conduit nipple.
6. Gutter size in panel boxes, on all sides, shall be in accordance with the NEC. Cabinets containing through feeders shall have the gutters space increased by the amount required for auxiliary gutters in the NEC.

B. Trims and doors:
1. Panels shall have hinged covers with concealed trim clamps, doors shall have laser cut trims with concealed hinges, and flush lock, master keyed. Hinged cover shall have continuous piano hinge down one side with door opening by a single latch.
2. Flush trims shall overlap the box by at least 3/4-inch all around.
3. Surface trim shall have the same width and height as the box. Trim overlap or protruding past the box sides will not be allowed.
4. Flush or surface trims shall not have ventilating openings (225A. and less).
5. Secure trims to back boxes with indicating trim clamps.
6. Provide a welded angle on rear of trim to support and align trim to cabinet.

7. Provide separate trims for each section of multiple section panelboards. Doors of all sections shall be of the same height.
8. All branch circuit panelboards, and distribution panelboards with doors, shall be provided with key locking doors. Furnish two (2) keys for each lock to Owner.
9. Consult the drawings for flush or surface mounted panels.

C. Doors:
1. Provide concealed, butt hinges welded to the doors and trim.
2. For magnetic contactors incorporated in panelboards, provide separate interlocked doors for the contactors.
3. Provide keyed alike system for all panelboards.
4. Provide a typed directory card and metal holder, with transparent cover. Permanently mount holders on inside of doors.

D. Painting:
1. Thoroughly clean and paint trims and doors at the factory with primer and manufacturer's standard finish.

2.3 MOLDED CASE CIRCUIT BREAKERS FOR PANELBOARDS:

A. Breakers shall be UL listed and labeled, in accordance with the NEC, as shown on the drawings, and as specified.

B. Circuit breakers in panelboards shall be securely attached to the phase bus bar or branch circuit bar using the manufacturers standard method of attachment.
1. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips for 100 ampere frame or less. Magnetic trip shall be adjustable for breakers with 400 ampere frames and higher. Factory setting shall be used, unless otherwise noted.
2. Molded case circuit breakers for lighting circuits shall be switching duty rated and suitable for use on HID lighting circuits.
3. Ground fault circuit interrupter breakers (GFCI) for breakers less than 60 Amp shall be personnel protection (Class A) rated at 5 ma trip unless otherwise specified as equipment protection.

C. Breaker features shall be as follows:
1. A rugged, integral housing of molded insulating material.
2. Silver alloy contacts.
3. Arc quenchers and phase barriers for each pole.
4. Quick-make, quick-break, operating mechanisms.
5. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
6. Electrically and mechanically trip free.
7. An operating handle which indicates ON, TRIPPED, and OFF positions.
8. Line connections shall be bolt-on.
9. An overload on one pole of a multi-pole breaker shall automatically cause all the poles of the breaker to open.

D. Where new circuit breakers are noted on the drawings to be installed in existing panelboards, verify and coordinate the circuit breaker type and manufacturer with the existing panelboard.

2.4 SEPARATELY ENCLOSED MOLDED CASE CIRCUIT BREAKERS:

A. Where separately enclosed molded case circuit breakers are shown on the drawings, provide circuit breakers in accordance with applicable requirements of those specified for panelboards.

B. Enclosures are to be of the NEMA types shown on the drawings. Where the types are not shown, they are to be the NEMA type most suitable for the environmental conditions where the breakers are being installed.

2.5 SURGE ARRESTOR:

A. If shown on the drawings, provide an integralsurge arrestor for lightning protection. Refer to the drawings for voltage and phasing of service. Arrestor shall be located within or adjacent to the switchboard enclosure and connected with 12" maximum leads.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with NEC, as shown on the drawings, and as specified.

B. Where flush mounted panels occur on drawings contractor shall stub into nearest accessible ceiling void for future use, (1) 1 inch empty conduit for every four spare 20A. breakers or four unused panel spaces. For panels located on multi-floor buildings, conduits shall be stubbed into accessible ceilings both above and below panel. Conduits stubbed into ceiling void below panel shall be provided with conduit cap and labeled "To Panel Above".

C. Locate panelboards so that the present and future conduits can be conveniently connected. Coordinate the sizes of cabinets with designated closet space.

D. After wiring, label each circuit and install a typewritten schedule of circuits in each panelboard after approval by the Engineer. Schedule shall be typed on the paper directory cards. Include the room numbers and items served on the cards. Schedule shall indicate as-built conditions if circuiting is installed different than shown on the drawings. Schedule shall indicate final room numbering approved by Owner. Mark spare circuit breakers, and provisions for future circuit breakers, in pencil on schedule for future circuit marking.

E. Mount the panelboard so that maximum height of circuit breaker or switch above finished floor shall not exceed 78 inches. For panelboards which are too high, mount panelboard so that the bottom of the cabinets will not be less than six inches above the finished floor.

F. For panelboards located in areas accessible to the public, paint the exposed surfaces of the trims, doors, and boxes with finishes to match surrounding surfaces after the panelboards have been installed.

G. Other than minor deviations approved by the Engineer, provide circuit breaker arrangement in panelboards to match circuit numbering on the drawings.

H. All electrical distribution equipment (switchboards, panelboards, disconnect switches, transformers, starters, etc.) shall be of one manufacturer, unless specifically noted on the drawings, in the specifications, or approved by the Engineer. Intermixing of distribution equipment by different manufacturers will not be permitted.

I. If layout changes are required due to other electrical manufacturers equipment size, they must be submitted to and approved by the Engineer prior to bidding. National Electric Code working clearances must be maintained at all times. In no case will extra remuneration be allowed for layout changes that differ from those shown.

J. All items of distribution equipment required to be floor mounted shall be mounted on a minimum 3 1/2" concrete base above floor. Concrete base to be by Electrical Contractor.

K. Panel schedules are not shown on the drawings, however, copies of these schedules are available to the successful Contractor after bids are let, upon request to the Engineer.

L. Enclosures are to be of the NEMA types shown on the drawings. Where the types are not shown, they are to be the NEMA types most suitable for the environmental conditions where the equipment is to be installed.

M. All panelboards supplied from an emergency source shall have breakers provided with handle lock-off for each breaker. Breaker handles to be set in the "ON" position.

N. Turn all spare circuit breakers in panelboards to off position.

O. In addition to panel nameplate, provide a nameplate on the face of each branch circuit or distribution panel lettered: “WARNING, POTENTIAL ARC-FLASH HAZARDS EXIST WHILE WORKING ON THIS ENERGIZED EQUIPMENT”. All distribution panels shall also have a nameplate for each circuit breaker or fusible switch indicating load served if the distribution panel is not furnished with a circuit directory.

P. No piping, ductwork, or equipment foreign to the electrical installation shall be located in the electrical distribution equipment dedicated space as defined in N.E.C. Article 110.26 (F) (1). The Mechanical Contractor and Fire Sprinkler System Contractor shall locate ductwork and piping to clear the electrical distribution equipment dedicated space.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section includes the furnishing, installation, and connection of wiring devices.

PART 2 - PRODUCTS

2.1 RECEPTACLES:

A. LIST OF ACCEPTABLE RECEPTACLE MANUFACTURERS:

Manufacturer:	Hubbell	Leviton	P&S	Cooper	Wiremold
1. Receptacles:					
Non-Hospital Grade:					
Duplex: 20A. 125V.	HBL5362	5362A	5362A	5362	----------
Ground Fault: 20A. 125V.	GF 5362	8899	2094	XGF20	----------
Isolated Ground: 20A. 125V.	IG 5362	5362-IG	IG-6300	IG5362	----------
Hospital Grade:					
Duplex: 20A. 125V.	8300	8300	9300HG	8300	----------
Ground Fault: 20A. 125V.	GF8300	8899-HG	2091-SHG	XHGF20	----------
Isolated Ground: 20A. 125V.	IG8300	8300	IG-8300HG	IG5362HG	----------
Tamper Resistant	CSR20	5362-SG	SF309R2	TR5362	
2. Surge Suppression					
Non-Hospital Grade: 20A. 125V.	HBL5362SA	5380	5362	5362	53SR20
Hospital Grade: 20A. 125V.	HBL8362SA	8380	----------	8300	----------

B. Other manufacturers will be considered by the Engineer provided that specific device information is received by the Engineer prior to bid. No substitutions will be considered after bid letting.

C. Where receptacles are indicated on the drawings as "WP" (weatherproof) or required by applicable codes to be weatherproof, they shall be G.F.C.I. duplex grounded receptacles.
   1. Provide WP receptacles with a single lift hinged weatherproof coverplate for interior or exterior receptacles protected from the weather (not subjected to rain, water runoff, or hose down) or in other damp locations.
   2. Where interior or exterior WP receptacles are installed in wet locations (subjected to rain, water runoff, or hose down), provide heavy duty metallic weatherproof cover, “Suitable for wet locations while in use”, and UL Listed. The weatherproof cover shall be equal to Hubbell MX4280S.

D. See plans for special outlet schedule.

E. Receptacle body shall be formed of high-impact thermoplastic or urea and receptacle contacts shall be Bronze. Receptacles shall be listed by U.L. and conform to NEMA standards as well as the latest Federal Specification W-C-596. Certification that receptacle meets or exceeds N.E.M.A. Standards shall be submitted to the Engineer for approval.

F. All receptacles shall be self grounding with ground lug.

G. Install receptacles to clear all cabinets, equipment, etc.

H. Color of receptacles on normal power shall be AS SELECTED BY THE ARCHITECT. (Unless noted otherwise). Receptacles on emergency power shall be Red in color. Verify normal power colors prior to ordering. Electrical contractor shall provide testing in patient care areas per NFPA 99. Refer to execution section for additional information.

I. All 120V, 15 or 20A receptacles in exterior locations, elevator machine rooms, elevator pits, toilets and restrooms, per NEC, and as located on the plans shall be ground fault circuit interrupters (GFCI) for personnel protection (Class A) with 5ma trip.

J. In addition to those shown on the drawings, install ground fault receptacles in all locations within 6 feet of sinks, toilets and additional locations as may be required by the applicable edition of NFPA 70.

K. Provide duplex receptacle on separate circuit beside each telephone terminal board location and other communications equipment requiring 120V, power.

L. All projects that are permitted under the 2017 National Electric Code tamper proof receptacles shall be installed in the following areas regardless if they are shown on the drawings as tamper proof:
1. Dwelling units.
2. Guestrooms and guest suites of hotels and motels.
3. Child care facilities.
4. Preschools and elementary education facilities.
5. Business offices, corridors, waiting rooms, and the like in clinics, medical and dental offices and outpatient facilities.
6. Subset of assembly occupancies such as places of worship, waiting transportation, gymnasiums, skating rinks, and auditoriums.
7. Dormitories.

M. All projects that are permitted under the 2014 and earlier versions of the National Electric Code tamper proof receptacles shall be installed in the following areas regardless if they are shown on the drawings as tamper proof:
1. Dwelling units.
2. Guestrooms and guest suites of hotels and motels.
3. Child care facilities.
4. Preschools.

N. Once device manufacturer has been selected, all devices and plates in the project shall be of one manufacturer, unless noted otherwise on the drawings or in the specifications.

2.2 TOGGLE SWITCHES:

A. Wall Switches: Wall switches in general, used to control lighting, shall be quiet operating, listed by U.L. and conform to NEMA standards as well as the latest Federal Specification W-S-896e.

B. Switches shall be single pole, two-pole, three-way, four-way, keyed, and with pilot light as called for on the drawings. Groups of switches shall be under one gangplate. Where switches are in fire rated walls groups of switches shall be maximum of two (2) gangs under one cover plate.

C. Switches shall be as follows unless specified otherwise.

Single Pole	20 A. 125 V. 277 V.
Two Pole	20 A. 125 V. 277 V.
Three-Way	20 A. 125 V. 277 V.
Four-Way	20 A. 125 V. 277 V.
Pilot Light	20 A. 125 V. 277 V.
Key Switch	20 A. 125 V. 277 V.

D. All switches shall be self grounding w/ground lugs.

E. List of acceptable switch manufacturers:

Manufacturer:	P&S	Hubbell	Leviton	Cooper	
Toggle Switches	20AC1 Series	1221 Series	1221-2 Series	2221 Series	
Key Switches:	20AC1-L Series	HBL 1220-L Series	1221-2L Series	2221L Series	
Pilot Light Switches	20AC1-CPL Series	HBL 1220-PL Series	1221-PLR Series	2221PL Series	

F. Other manufacturers will be considered by the Engineer provided that specific device information is received by the Engineer prior to bid. No substitutions will be considered after bid letting.

G. Pilot light switches shall be illuminated toggle switch lighted red in "on" position. Key switches shall be master keyed.

H. Color of switches on normal power shall be as selected by the Architect. (unless noted otherwise) Switches on emergency power shall be Red in color. Verify normal power colors prior to ordering.

I. Provide barriers between 277V. switches, between 277V. and 120V. switches, and between combination 277 volt switches/120 volt receptacles installed in a common outlet box.

J. Incandescent wall box dimmers shall be linear slide type with smooth face plates, no exposed cooling fins, equal to Lutron NT-600, NT-1000, or NT-1500 for loads to 1500W. For Loads 1500W to 2000W, Lutron N-2000. For multigang dimmer installations, derate dimmer wattage per manufacturers requirements, or install dimmers in separate outlet boxes. Verify color of face plate and dimmer with Architect prior to ordering. Dimmer switches for LED screw-in lamps shall be coordinated with LED lamp provided prior to purchasing.

K. LED 0-10V dimmer switch shall be equal to Legrand RH4FBL3PTC. Verify the color of the faceplate with the Architect prior to ordering.

L. Once device manufacturer has been selected, all devices and plates in the project shall be by the same manufacturer, unless noted otherwise on the Drawings or in the Specifications.

2.3 WALL PLATES:

A. All wall plates shall be stainless steel, smooth surface wall plates. Where plates are noted to be engraved or labeled, provide stainless steel wall plates in color to match other plates and provide engraved filled letters. Stainless steel plates where used or specified shall be .032" nominal thickness, non-magnetic.

B. Color shall be as selected by the Architect for devices on normal power (unless noted otherwise), red for devices on emergency power.

C. For receptacles or switches mounted adjacent to each other, wall plates shall be common for each group of receptacles or switches.

D. Provide blank plates for all telephone, cable TV, communication outlets not used by telephone, cable TV, or communications installers.

E. All emergency receptacle and switch cover plates shall indicate panel name and circuit number from which the device is served.

F. Plates shall be set plumb and parallel with the wall. There shall be no gap between the plate and the wall surface.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with the NEC, and as shown on the drawings.

B. Switches shall be located on the latch side of all doors. If switches must be located on the hinge side of a door, they shall be located so that they are not behind the door when it is open. All questionable locations shall be brought to the Engineers/Architects attention prior to rough-in.

C. Verify all outlet locations on the job prior to rough-in. Locations may be altered up to 6'-0" in any direction as directed by the Architect or Engineer without additional cost to the Owner.

D. Electrical contractors shall provide testing for all 120V, single phase 20A receptacles located in patient care areas per NFPA 99. At a minimum, the following items shall be tested and documented:
   1. The physical integrity of each receptacle shall be confirmed by visual inspection.
   2. The continuity of the grounding circuit in each electrical receptacle shall be verified.
   3. The correct polarity of the hot and neutral connections in each electrical receptacle shall be confirmed.
   4. The retention force of the grounding blade of each electrical receptacle (except locking-type receptacles) shall be not less than 115 grams (4 ounces).

END OF SECTION

SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section includes all low voltage disconnect switches either stand alone in NEMA enclosures, fusible and non-fused, in panelboards, switchboards, or switchgear.

1.2 MANUFACTURERS:

A. Approved Manufacturers
   1. Square 'D'
   2. General Electric
   3. Siemens/ITE
   4. Cutler Hammer

B. Disconnect switches shall be by the same manufacturer as the remainder of the distribution equipment on the project. No mixing of manufacturers on the project.

PART 2 - PRODUCTS

2.1 LOW VOLTAGE FUSIBLE SWITCHES RATED 800 AMPERES AND LESS:

A. Quick-make, quick-break type in accordance with UL 98, NEMA KS 1 and NEC.

B. Shall be capable of accepting UL and NEMA standard fuses.

C. Shall have the following features:
   1. Switch mechanism shall be the quick-make, quick-break type.
   2. Copper blades, visible in the OFF position.
   3. An arc chute for each pole.
   4. External operating handle shall indicate ON and OFF position and shall have lock-open padlocking provisions.
   5. Mechanical interlock shall permit opening of the door only when the switch is in the OFF position, defeatable by a special tool to permit inspection.
   6. Fuse mounting for the size and type of fuses specified. Furnish switches completely fused. Furnish a complete set of spare fuses for each size and type of fuse being installed.
   7. Solid neutral for each switch being installed in a circuit which includes a neutral conductor.
   8. Enclosures:
      a. Shall be NEMA 1 for interior, NEMA 3R for exterior and other types shown on the drawings for the switches.

b. Where the types of switch enclosures are not shown, they shall be the NEMA types which are most suitable for the environmental conditions where the switches are being installed.

9. All fuse holders shall have rejection features to reject all fuses not specified. Provide fuse rejection kits as required.

D. Unless indicated otherwise, switches shall be heavy duty, horsepower rated for the load served, and provided with ground kit.

E. Disconnect switches shall be fused except for disconnect switches that have individual fuse protection at point circuit receives its supply.

F. Provide dead front type for all exterior disconnects on grade level when so required by local code.

G. All fused disconnect switches shall have a minimum rating of 100,000 A.I.C. with fuses installed unless noted otherwise on the drawings.

2.2 LOW VOLTAGE UNFUSED SWITCHES RATED 800 AMPERES AND LESS:

A. Shall be the same of Low Voltage Fusible Switches rated 800 amperes and less, except it shall not accept fuses.

2.3 THERMAL OVERLOAD SWITCHES:

A. Provide/install toggle type switches, voltage and horsepower rated for the load served 20 or 30 Amp for all small mechanical equipment as indicated.

2.4 FUSES:

A. This paragraph applies to all fuses provided under Division 26.

1. Cartridge type fuses of proper size and type as required shall be furnished and installed for all switches and panelboards throughout and an additional supply of three spare fuses of each size and type shall be furnished in original packages to the Owner. Furnish NEMA 1 enclosure with hinged cover equal to Bussmann Type SFC or Edison ESFC, for storing all spare fuses located adjacent to main service equipment. Fuses for motor and mechanical equipment shall be sized per nameplate data and N.E.C.
2. Fuses shall be manufactured by Bussmann Mfg. Co., Ferraz-Shawmut Co., Littelfuse or approved equal by Engineer. Fuse types shall be installed as follows:

Main Service and Distribution Feeder Protection:

	Bussman	Littelfuse	Ferraz Shawmut
601 amps and larger 600 volts and less (Class L)	KRP-C/KTN	KLPC	A4BQ

600 amps and less 250 volts and less (Class RK1)	LPN-RK	LLN-RK	A2D-R
600 amps and less 600 volts and less (Class RK1) Motors and Primary Feeders for Transformers:	LPS-RK	LLS-RK	A6D-R
250 volts and less (Class RK5)	FRN-R	FLN-R	TR-R
600 volts and less (Class RK5)	FRS-R	FLS-R	TRS-R

3. Class T fuses will not be accepted, unless they are a part of a manufacturers assembly or approved by the Engineer. Class J fuses may be used as an alternate to the Class R fuses listed above.
4. Fuses installed on project shall be by one manufacturer only. (Do not intermix Manufacturers.)

2.5 EQUIPMENT CONNECTIONS:

A. For 120 volt motors 1/2 HP- and less, 15 amperes and less, Contractor shall provide Bussmann "SSY" box cover unit for indoor application and "SSN" box cover unit for outdoor applications, or equal by Perfect-Line, with fustat plug fuse and integral toggle switch for motors 1/2 HP-120V. and less. Fustats for cord and plug equipment with fuses 15 amperes and less shall be Bussmann “SRY” box cover unit, or equal by Perfect-Line, with fustat plug fuse. Mount fustats in housings of equipment served wherever possible. Plug fuses for motors shall be sized based upon 125% of manufacturer's nameplate full load amperage unless otherwise indicated on drawings.

B. For 3/4 HP-120V. motors, Contractor shall provide (1) 20 amp 1 pole 120 volt toggle disconnect switch with a Bussmann ‘HPD’ fuse holder and ‘FNQ-R’ fuse at each unit. Switch and fuse holder to be mounted in cover of a 4” square, 2 1/8” deep junction box at each unit. For 3/4 HP-120V. motors that are provided with cord and plug, Contractor shall provide 20 amp 120 volt duplex receptacle with (1) 20 amp 1 pole 120 volt toggle disconnect switch on line side of receptacle, and Bussmann ‘HPD’ fuse holder and ‘FNQ-R’ fuse on line side of receptacle. Switch, receptacle, and fuse holder to be mounted in cover of a 4” square, 2 1/8” deep junction box at each unit. Fuses for motors shall be sized based upon 125% of manufacturer's nameplate full load amperage unless otherwise indicated on drawings.

C. For connections to 277 volt equipment, Contractor shall provide (1) 20 amp 1 pole 277 volt toggle disconnect switch with a Bussmann ‘HPD’ fuse holder and ‘FNQ’ fuse at each unit. Switch and fuse holder to be mounted in cover of a 4” square, 2 1/8” deep junction box at each unit. Fuses for motors shall be sized based upon 125% of manufacturer's nameplate full load amperage unless otherwise indicated on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with the NEC and as shown on the drawings.

B. Enclosures shall be of the NEMA types shown on the drawings. Where the NEMA type is not shown, they are to be the NEMA type most suitable for the environmental conditions where the equipment is to be installed.

C. No piping, ductwork, or equipment foreign to the electrical installation shall be located in the electrical distribution equipment dedicated space as defined in N.E.C. Article 110.26 (F) (1). The Mechanical Contractor and Fire Sprinkler System Contractor shall locate ductwork and piping to clear the electrical distribution equipment dedicated space.

END OF SECTION

SECTION 262913 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section includes all motor starters and motor control stations, either stand alone in NEMA enclosures, combination type with disconnect, or in panelboards or motor control centers.

PART 2 - PRODUCTS

2.1 MOTOR STARTERS:

A. Approved manufacturers: Square 'D', Cutler Hammer, Siemens/ITE, or General Electric. NEMA and NEC shall apply. Starters shall be by the same manufacturer as the remainder of the distribution equipment on the project. No mixing of manufacturers on the project.

B. All starters shall be fully NEMA rated. I.E.C. rated starters will not be allowed. Starters shall have all components made by one manufacturer, and shall have the following features:
   1. Enclosed type as shown on the drawings.
   2. Safety switches within the motor controller enclosures shall have external operating handles with lock-open padlocking provisions and shall indicate the ON and OFF positions.
   3. Motor control circuits:
      a. Shall operate at not more than 120 volts.
      b. Shall be grounded except as follows:
         1) Where isolated control circuits are shown.
         2) Where manufacturers of equipment assemblies recommend that the control circuits be isolated.
      c. Incorporate a separate, heavy duty, control transformer within each motor controller enclosure to provide the control voltage for each motor operating over 120 volts.
      d. Incorporate primary and secondary overcurrent protection for control power transformers in accordance with the NEC.
   4. Overload current protective devices:
      a. Thermal or solid state induction type Class 20. Class 10 will not be acceptable.
      b. One for each pole.
      c. Manual reset on the door of each motor controller enclosure.
      d. Overload thermal units shall be sized on the basis of actual motor nameplate current. Overloads shall be non-adjustable NEMA standard trip and shall be available in sizes covering the complete NEMA horsepower.
      e. Check every motor controller after installation and verify that correct sizes of protective devices have been installed.
   5. Auxiliary contacts, H-O-A selector switches, green “off” and red “on” pilot light push-buttons shall be provided. One closed contact when the starter is deactivated and one closed contact when the starter is activated.

6. Other devices and accessories as shown on the drawings or otherwise required by control drawings and approved shop drawings.
7. Enclosures:
   a. Shall be NEMA 1 for interior, NEMA 3R for exterior and other types as shown on the drawings for the motor controllers.
   b. Where the types of motor controller enclosures are not indicated, they shall be the NEMA types which are the most suitable for the environmental conditions where the motor controllers are being installed.
   c. Doors shall be mechanically interlocked to prevent opening unless the breaker or switch within the enclosure is open.
   d. Thoroughly clean and paint the enclosures at the factory with manufacturer's prime coat and standard finish.
8. Each controller for motors 10 HP and larger shall be equipped with a 3 phase sensing loss of phase relay with automatic reset. Equal to Time Mark model 258.

C. Motor controllers incorporated with equipment assemblies shall also be designed for the specific requirements of the assemblies.

D. Additional requirements for specific motor controllers, as indicated in other sections, shall also apply.

E. Install a disconnect safety switch near and within sight of each motor. Combination type switch/starter in one enclosure are acceptable if listed as one piece. Switches shall comply with Section 26 2816.

F. Reduced Voltage Motor Controllers (Only where indicated on the drawings):
1. Shall be installed for all motors 25HP and larger and where shown on the drawings.
2. Shall be auto transformer as indicated on the drawings, or included in the temperature control section of these specifications.
3. Shall have closed circuit transition for the types which can incorporate such transition.
4. Shall limit inrush currents to not more than 70 percent of the locked rotor currents.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Installation shall be in accordance with the NEC, and as shown on the drawings.

B. Enclosures are to be of the NEMA types shown on the drawings. Where the types are not shown, they are to be the NEMA type most suitable for the environmental conditions where the equipment is to be installed.

C. No piping, ductwork, or equipment foreign to the electrical installation shall be located in the electrical distribution equipment dedicated space as defined in N.E.C. Article 110.26 (F) (1). The Mechanical Contractor and Fire Sprinkler System Contractor shall locate ductwork and piping to clear the electrical distribution equipment dedicated space.

END OF SECTION

SECTION 265010 – LED LIGHTING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. All of the Contract Documents, as listed on the Table of Contents and including General and Supplementary Conditions and Division 01, General Requirements, shall be included in, and made part of, this Section.

1.2 DESCRIPTION OF WORK

A. The work of this Section shall include furnishing and installation of all interior and exterior lighting fixtures and necessary supports and devices for a complete functioning lighting system, including final aiming and adjustment as applicable in coordination with the Architect and/or the Lighting Designer.

B. The work under this Contract shall also include all labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision, and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings, but which are usually provided or are essential for proper installation and operation of all systems as indicated on the drawings and specified herein.

C. The specifications and drawings describe the minimum requirements that must be met by the Contractor for the installation of all work as shown on the drawings and as specified herein under.

D. The following general systems and equipment shall be provided for the renovated areas of the existing building, as a minimum, but not necessarily limited to the following:
   1. Lighting fixtures
   2. Lamps
   3. Drivers

1.3 RELATED WORK

A. For work to be included as part of this Section, to be furnished and installed by the Electrical Subcontractor, refer to the Related Work section of Specification Section 260510.

B. Carefully examine all of the Contract Documents, criteria sheets, and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.

1.4 REFERENCES

A. All lighting fixtures including custom fixtures and modified standard products shall comply with all applicable provisions of the following Codes and Trade Standard Publications, and are hereby incorporated into, and made a part of, the Contract Documents:

1.	ANSI:	American National Standards Institute
2.	ASTM:	American Society for Testing and Materials
3.	ETL:	Electrical Testing Labs (US)
4.	FS	Federal Specifications
5.	IEC IP Rating	Ingress Protection Enclosure Ratings and Standards
6.	IEEE:	Institute of Electrical and Electronics Engineers
7.	IES:	Illuminating Engineering Society
8.	IPCEA:	Insulated Power Cable Engineers Association
9.	MIL-STD-461F	EMI Characteristics Requirements for Equipment
10.	NEC:	National Electrical Code
11.	NEMA:	National Electrical Manufacturers Association
12.	NFPA 70:	National Electrical Code
13.	OSHA:	Occupational Safety and Health Administration
14.	ROHS	Restriction of Hazardous Substances in LED
15.	UL:	Underwriters' Laboratories

1.5 QUALITY ASSURANCE

A. The manufacturers listed within the Lighting Fixture Schedule have been preselected for use on this project. No submittal will be accepted from a manufacturer other than those specified in the Lighting Fixture Schedule.

1.6 WARRANTY

A. In addition to the provisions of the General Requirements, Supplementary General Requirements and Section 260510 regarding guarantees and warranties for the work under this Contract, lighting fixture manufacturer(s) shall provide a total system warranty that includes the fixture, lamps, drivers and all associated wiring and appurtenances provided with each fixture.

B. For a period of one year after Owner's initial acceptance and establishment of the beginning date of the warranty period, and at no additional cost, promptly provide and install replacements for fixtures or components which, in the opinion of the Owner, are defective in materials or workmanship under normal operating conditions. If approved to do so by the Owner, repair installed equipment at the job site to Owner's satisfaction, provided that the Contractor repairs any damage to adjacent Work. For any time during the warranty period that fixtures are not fully functional due to defects in materials or workmanship, provide or pay for and install and remove suitable and adequate temporary lighting fixtures. All replacement fixtures or components shall be warranted to be free of defects in workmanship or materials for a period of one year following the replacement. The Contractor shall replace any defective replacements during their warranty period.

1.7 BASE BID

A. The base bid lighting fixtures that are specified in the Lighting Fixture Schedule by manufacturer and model numbers represent the standard for photometric performance, energy efficiency, aesthetics, physical dimensions, finishes, materials and construction integrity. Equal products from the list of approved alternate manufacturers listed in the Lighting Fixture Schedule may be submitted in lieu of the specified standard.

B. Contractor shall supply ‘contractor net’ unit pricing for each specified lighting fixture type. Unit pricing shall be for equipment only and not include installation or miscellaneous electrical costs. The unit price supplied shall be guaranteed for the project and remain valid for additions and/or deletions of the fixture throughout the duration of the project.

C. Within ninety (90) days of contract award, the successful Contractor shall issue to the Architect a complete list of lighting products submittals, including manufacturer model numbers, catalog cuts and photometric testing information.

D. Should the Contractor anticipate that the delivery schedule of any specified product may adversely impact the construction schedule, it shall be brought to the Architect’s and the Lighting Designer’s attention at the time of bidding.

1.8 APPROVED LIGHTING FIXTURE MANUFACTURERS

A. Alternate light fixture packages shall be considered for approval pending the following information is provided to the engineer of record six business days prior to the project bidding:
   1. Fixture cut sheets for all proposed equal fixtures. the cut sheets shall have the specific model number indicated on each individual cut sheet
   2. Provide a cover page with all fixture model numbers listed
   3. The cover page and all individual fixture cut sheets shall be combined into a single pdf. packages that are submitted that do not meet the criteria above will not be reviewed for approval

1.9 SUBMITTALS

A. Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with Section 01 3300 – Submittal Procedures in the manner described therein, modified as indicated in Section 26 0510 and as noted hereinafter.

B. If requested by the Architect and/or Lighting Engineer, submittal for specified fixture types shall also include an operable non-returnable sample with 120 volt 72-inch grounded cord and plug with specified lamp color temperature and finish. All samples shall include a label describing fixture type, manufacturer catalog number, lamp color temperature, CRI index and lumen output.

C. Submit complete manufacturer's product data of all materials and systems to the Architect and the Lighting Designer for approval, consisting of complete product description and specifications, complete performance test data, complete preparation and installation instructions, and all other pertinent technical data required for complete product and product use information. The General and Electrical Contractor is to verify and coordinate all ceiling grid types and ceiling hanger types with fixture catalog numbers.

D. All shop drawings shall have clearly marked the fixture type, the appropriate specification number and/or drawing designation for identification of the submittal. Indicate on shop drawings, materials, finishes, metal gauges, overall and detail dimensions, sizes, electrical and mechanical connections, fasteners, welds, joints, end conditions, provisions for the work of others, and similar information. Include pertinent mounting details including hung ceiling construction. Indicate type and extent of approved inert insulating materials to prevent electrolytic corrosion at junctions of dissimilar metals shall be supplemented by additional drawings if information or descriptions listed above are not included in the cuts.

E. Submit independent laboratory photometric data in the required number of copies and in format as directed by the Architect or the Lighting Designer. Photometric data shall be submitted for standard, “off-the-shelf” units, at the time the manufacturer’s cuts are submitted. Photometric testing and reporting shall conform to IES procedures.

F. Manufacturer's Catalogue Sheets shall indicate input and load electrical characteristics, ambient temperature rating, noise level rating, mounting methods and UL listing.

G. LED fixture manufacturer shall submit, with fixture Shop Drawing or Catalogue Sheet the following information:
   1. IESNA LM-79 and LM-80 test reports including, but not limited to, testing agency, report number, date, catalog number, type of equipment, LED source tested and ambient temperature.
   2. Certification that the manufacturer is in compliance with all standards and IESNA documentation.
   3. Certification that the fixture meets recyclability requirements.

H. Disposition of shop drawings shall not relieve the Contractor from the responsibility for deviations from drawings or specifications unless he has submitted, in writing, a letter itemizing or calling attention to such deviations at time of submission and secured written approval from the Architect and the Lighting Designer, nor shall such disposition of shop drawings relieve the Contractor from responsibility for errors in shop drawings or schedules.

I. Shop drawings, samples, test data and certificates shall be submitted for approval in accordance with the requirements of the Contract Documents. Fixtures or other materials shall not be shipped, stored, or installed into the work unless prior approval has been received, based upon the submittal of shop drawings, samples, catalogue cuts, test data, certificates or other materials submitted for approval. Make modifications to fixtures in accordance with the Architect's and the Lighting Designer’s comments concerning submittals, as a part of the work of this Section.

J. Submittal Schedule
   1. Within 30 calendar days after award of General Contract, a List of Intended Manufacturers and estimated fabrication lead times shall be submitted to the Architect and the Engineer. "Lead times" shall be measured in weeks, beginning from the manufacturer's receipt of approved shop drawings and release, and ending at shipment. The Architect and the Lighting Designer shall approve or disapprove each manufacturer.
   2. Within 15 days after Contractor's receipt of the Architect's and the Engineers response to the List of Intended Manufacturers, copies of purchase orders and manufacturers' acknowledgements for all fixtures specified, conforming to the Architect's and the Lighting Designer’s responses, shall be forwarded to the Architect and the Lighting Designer. The purchase orders and the manufacture acknowledgements need not list prices but shall

contain a warranted fabrication lead time, in weeks, as defined above. These fabrication times shall be adequate for the timely completion of the job.

3. Within 30 days after date of manufacturer's acknowledgement of order, Contractor shall forward to the Architect and the Engineer complete shop drawings, and/or catalogue cuts for all specified fixtures.
4. Within 15 days after receipt of reviewed shop drawings marked with "no exceptions taken" or "revise as indicated – no resubmittal required", Contractor shall forward to the Architect and the Lighting Designer a warranted shipment date for each specified fixture, as well as forwarding samples, texts, or any outstanding data required for approval.
5. Within 15 days after Contractor's receipt of reviewed shop drawings marked with “resubmittal required”, revised shop drawings shall be resubmitted to the Architect and the Lighting Designer.
6. Contractor shall call to the attention of the Architect and the Engineer any submittals that have not been returned to him in a timely manner and that might affect the appropriate delivery of fixtures.

1.10 COORDINATION

A. The work of this Section shall be coordinated with other work of the Contractor. The placement of all access panels shall be coordinated with all other Trades and with the Architect and the Engineer.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide materials, equipment, appurtenances, and workmanship for the work of this Section conforming to the highest commercial Standards as specified and indicated on the drawings. Make fixture parts and components not specifically identified or indicated on the drawings, of materials most appropriate to their use or function, and resistant to corrosion and to thermal and mechanical stresses encountered in the normal application and function of the fixtures.

B. Provide recessed fixtures that are constructed to be suitable for and compatible with the ceiling, wall, floor or pavement materials and construction in which they shall be installed.

2.2 MATERIALS AND FABRICATION

A. Provide fixtures, completely factory assembled, wired, and equipped with necessary sockets, drivers, wiring, shielding, reflectors, channels, lenses and other parts and appurtenances necessary to complete the fixture installation and deliver to project site ready for installation.

2.3 FINISHES

A. Lighting fixture finishes shall be selected by the Architect and owner. The Architect and the Owner shall select finishes and indicate the color selections on the shop drawing submittals.

2.4 FIXTURE WIRING

A. Provide wiring channels and wireways free from projections and rough or sharp edges throughout. At points or edges over, which conductors shall pass and may be subject to injury or wear, round bush to make a smooth contact surface with the conductors.

B. Install insulated bushings at points of entrance and exit of flexible wiring.

2.5 LED DRIVERS

A. Provide drivers for LED lamps that are suitable for the electrical characteristics of the supply circuits to which they are to be connected, and which are suitable for operating the specified lamps. Provide drivers which, unless specifically indicated otherwise or are not available for the specified lamp, have the following characteristics:
1. Constant Current/Voltage.
2. Power factor .90
3. Total harmonic distortion 20%
4. Lamp current crest factor 1.7
5. UL Class 2
6. Sound Rating A

B. Provide drivers conforming to UL and ANSI specifications and displaying labels or symbols of approval by the UL and of certification by the CBM. Design, fabricate and assemble component parts of drivers in accordance with the latest requirements of the NEC. Mark drivers “Class 2” indicating approved integral driver protection. This driver protection is provided by a built-in self-resetting thermally actuated device that will remove the driver from line when excessive driver temperature is reached.

C. Rigidly mount drivers, unless specifically indicated otherwise, to the inside of the top of the fixture housing, with driver surfaces and housing in complete contact for efficient conduction of driver heat. Permanently affix driver mounting screws to the fixture housing. Provide only fixtures whose design, fabrication, and assembly prevent overheating or cycling of lamps and drivers under any condition of use.

D. Dimming drivers shall be compatible with 3-wire (Line Voltage), Electronic Low Voltage (ELV) or Digital Addressing as required by lighting control vendor and fixture manufacturer. Provide identical drivers within each fixture type.

E. Provide drivers having the lowest sound-rating available for the lamps specified and clearly showing their respective sound ratings. Replace drivers found by the Architect or the Lighting Designer to be unduly noisy, without charge, prior to acceptance of the job. Inform the Architect and the Lighting Designer in writing if drivers with a sound rating other than A are to be provided.

F. For outdoor use and wherever drivers are used outside a heated environment provide drivers capable of lamp-starting at any temperature down to 0 degrees F.

G. Approved Driver Manufacturers
1. Advance
2. General Electric
3. Hatch

4. Lutron
5. Sylvania (Osram)
6. Universal
7. Thomas Research
8. Eldo

H. Drivers shall have a 5-year warranty from date of acceptance of the completed installation.

2.6 LIGHT EMITTING DIODE ASSEMBLIES

A. These requirements refer to the LED assembly, including diodes, integrated circuit boards, lenses and remote-phosphor panels, heat sinks and assembly frames, and drivers or power supplies (if integrated with driver).

B. LED diode arrays, unless otherwise specified in the Lighting Fixture Schedule.
1. Shall be 3500°K correlated color temperature with a maximum 3-step MacAdam ellipse variation
2. CRI ≥ 85
3. Lamp life ≥ 50,000 hours and maintain ≥ 70% of initial lamp lumen output throughout this period.
4. Have a minimum efficacy of 90 lumens per watt.
5. LED arrays shall meet all applicable IESNA and ANSI standards relating to measurement and construction in effect at their time of purchase.

C. Manufacturer shall provide LED arrays and components that comply with the criteria listed above and meet or exceed the current technology or standards at the time of production. Ninety (90) days prior to production, manufacturer shall provide re-submittal of specified fixtures documenting specific LED arrays to be installed that match the performance, specified color temperature, lumen output, photometric distribution, and method of control. Any variance between the submitted fixture type and specified model shall be clearly documented by the Contractor and included with the fixture submittal.

D. All LED assemblies shall be covered by a (5) year full manufacturer's warranty covering the assembly and its replacement in case of failure, provided that operating conditions (thermal and electrical) are maintained within the manufacturer's stated limits.

E. For each LED fixture type, the vendor shall provide an IES formatted photometric performance analysis report by a recognized independent testing laboratory. Test procedures and data presentation shall be as per IESNA LM-79.

F. All LED diode arrays shall be field replaceable with minimal labor and shall be maintainable without removal of the fixture housing from its location. The fixture manufacturer shall keep a record of the physical bin, color temperature, chromaticity, and efficacy rating for each array series in order to provide future replacement units that match the originally furnished array in color and photometric performance.

G. For each LED fixture type, the vendor shall submit an illustrated manual documenting how the fixture LED array and associated electronics are replaced in the field in case of failure. The report shall also document the steps taken by the fixture vendor to stock replacement LED components

for minimum period of (10) years after the date of the project's substantial completion, and the appropriate contact information to obtain replacements.

H. For other fixtures, provide lamps as specified, or if not specified, as rated by the manufacturer. If specification is not complete, contact the Architect and the Lighting Designer for clarification.

I. The following LED lamp manufacturers are approved:
1. Cree
2. General Electric
3. Philips
4. Sylvania (Osram)
5. Nichia
6. Ushio
7. Venture
8. Xicato
9. Samsung

2.7 LENSES/FACEPLATES/TRIM MOUNT TYPE

A. Where plastic lenses are indicated, provide lenses of virgin methyl methacrylate, unless otherwise indicated.

B. Make lenses, louvers or other light diffusing elements contained in frames removable, but positively held within the frames so that hinging or other motion of the frame shall not cause the diffusing element to drop out.
1. Fixture lens material shall sufficiently diffuse LED lighting sources so as to not telegraph LED images. All lens perimeter joints, and butted seams shall fit tightly in order to prevent light leaks.

C. All recessed downlights in painted dry wall ceilings or acoustic tile ceilings shall have self-trimming reflectors with white flanges. All recessed downlights in perforated metal or wood ceilings shall have self-trimming reflectors in finishes as specified in the Lighting Fixture Schedule.

D. Coordinate all ceiling grid or flange mounting conditions with the architectural drawings, specifications, and approved ceiling submittals.

2.8 EXTERIOR FIXTURES

A. Provide fixtures designed and manufactured specifically for outdoor service. Make components, including nuts, bolts, rivets, springs, and similar parts of materials of effective corrosion resistance or of materials which have been subjected to finishing treatment which shall ensure such resistance.

B. Provide fixtures for use outdoors or in areas designated as damp locations which are suitably and effectively gasketed to prevent access of moisture into electrical components or enclosing diffusers, lenses, or globes.

C. Provide metal parts of fixtures for use in outdoor or damp locations which are specified as requiring painting with suitable weather and moisture resisting qualities equal to epoxy-based coatings.

D. Provide anodized aluminum for aluminum parts of exterior fixtures which are not specified as requiring a painted finish.

2.9 LIGHTING FIXTURES

A. Refer to lighting fixture schedule on the drawings and the lighting fixture cut sheets attached to the end of this section.

PART 3 - EXECUTION

3.1 COOPERATION AND WORK PROGRESS

A. The Electrical work shall be carried on under the usual construction conditions in conjunction with all other work at the site. The Electrical Subcontractor shall cooperate with the Architect, the Lighting Designer, General Contractor, all other Subcontractors, and equipment suppliers working at the site. The Electrical Subcontractor shall coordinate the work and proceed in a manner so as not to delay the progress of the project.

B. The Electrical Subcontractor shall coordinate his work with the progress of the building and other Trades so that he will complete his work as soon as conditions permit and such that interruptions of the building functions will be at a minimum. Any overtime hours worked, or additional costs incurred due to lack of or improper coordination with other Trades or the Owner by the Electrical Subcontractor shall be assumed by him without any additional cost to the Owner.

C. The Electrical Subcontractor shall furnish information on all equipment that is furnished under this Section but installed under another Section to the installing Subcontractor as specified herein.

D. The Electrical Subcontractor shall provide all materials, equipment, and workmanship to provide for adequate protection of all electrical equipment during the course of construction of the project. This shall also include protection from moisture and all foreign matter. The Electrical Subcontractor shall also be responsible for damage which he causes to the work of other Trades, and he shall remedy such injury at his own expense.

E. Waste materials shall be removed promptly from the premises. All material and equipment stored on the premises shall be kept in a neat and orderly fashion. Material or equipment shall not be stored where exposed to the weather. The Electrical Subcontractor shall be responsible for the security, safekeeping, and damages, including acts of vandalism, of all material and equipment stored at the job site.

F. The Electrical Subcontractor shall be responsible for unloading all electrical equipment and materials delivered to the site. This shall also include all large and heavy items or equipment which require hoisting. Consult with the General Contractor for hoisting/crane requirements. During construction of the building, the Electrical Subcontractor shall provide additional protection against moisture, dust accumulation and physical damage of the main service and

distribution equipment. This shall include furnishing and installing temporary heaters within these units, as approved, to evaporate excessive moisture and ventilate it from the room, as may be required.

G. It shall be the responsibility of the Electrical Subcontractor to coordinate the delivery of the electrical equipment to the project prior to the time installation of equipment will be required; but he shall also make sure such equipment is not delivered too far in advance of such required installation, to ensure that possible damage and deterioration of such equipment will not occur. Such equipment stored for an excessively long period of time (as determined in the opinion of the Architect and the Lighting Designer) on the project site prior to installation may be subject to rejection by the Architect and/or the Lighting Designer.

H. The Electrical Subcontractor shall erect and maintain, at all times, necessary safeguards for the protection of life and property of the Owner, Workmen, Staff and the Public.

I. Prior to installation, the Electrical Subcontractor has the responsibility to coordinate the exact mounting arrangement and location of electrical equipment to allow proper space requirements as indicated in the NEC. Particular attention shall be given in the field to group installations. If it is questionable that sufficient space, conflict with the work of other Subcontractors, architectural or structural obstructions will result in an arrangement which will prevent proper access, operation or maintenance of the indicated equipment, the Electrical Subcontractor shall immediately notify the Contractor and not proceed with this part of the Contract work until definite instructions have been given to him by the Architect and the Lighting Designer.

3.2 INSTALLATION

A. General

1. Unless specifically noted or indicated otherwise, all equipment and material specified in Part 2 of this specification or indicated on the drawings shall be installed under this Contract whether or not specifically itemized herein. This Section covers particular installation methods and requirements peculiar to certain items and classes or material and equipment.
2. The Electrical Subcontractor shall obtain detailed information from manufacturers of equipment provided under Part 2 of this specification as to proper methods of installation.
3. The Electrical Subcontractor shall obtain final rough-in dimensions and other information as needed for complete installation of items furnished under other Sections or furnished by the Owner.
4. The Electrical Subcontractor shall keep fully informed of size, shape and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching, as necessary.
5. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws, and other such items, shall be of a galvanized or cadmium plated finish or of another approved rust-inhibiting coating.
6. Throughout this Section where reference is made to steel channel supports, it shall be understood to mean that the minimum size shall be 1 5/8" mild strip steel with minimum wall thickness of 0.105", similar to Unistrut P1000 or equal products manufactured by Kindorf or Husky Products Co. Where reference to channel supports is made under "Lighting Fixtures" paragraph of this Section, the maximum length of span shall be 10'-0".

If longer spans are required, the size and wall thickness of the steel channel support shall be as specifically approved and certified by a licensed Structural Engineer.

B. Lighting Fixtures

1. Furnish, assemble, hang, and connect all lighting fixtures. Lighting fixtures shall be as indicated on the drawings.
2. Install each fixture properly and safely. Provide hangers, rods, mounting brackets, supports, frames, yokes, support bars and any other equipment required for a complete installation. Refer to Section 260510 for Hangers and Supports.
3. Lay-in recessed fixtures in grid type ceilings shall be supported from the underside of roof or floor slab, and utilize hangers, as indicated in Section 260510, with attachments to building construction independent of other systems. All fixtures shall have a minimum of (2) hangers supports.
4. All lighting fixtures shall be supported from the slab above and shall not be suspended from ducts, piping, equipment, ceiling support system, etc.
5. Where continuous rows of lighting fixtures are installed (pendant mounted), the Electrical Contractor shall furnish and install appropriate mounting channels to properly align fixtures. Use Kindorf or Unistrut channels.
6. Before ordering fixtures, the Electrical Contractor shall verify with the General Contractor the type of ceilings which shall be used in the various spaces.
7. Coordinate fixture locations and mounting heights with the Architectural plans, reflected ceiling plans and other reference data prior to installation. Coordinate fixture types with the electrical lighting drawings.
8. Do not scale electrical drawings for exact location of the lighting fixtures. Consult the architectural reflected ceiling plans for the proper locations of lighting fixtures.
9. Prior to fabrication and submittal of shop drawings, check for adequate headroom and non-interference with other equipment such as ducts, pipes, or openings.
10. Pendant or surface mounted fixtures shall be provided with required mounting devices and accessories, including hickeys, stud extensions, ball aligners, canopies, and stems. Locations of fixtures in mechanical areas shall be coordinated with the Mechanical Contractor. Mounting stems of pendant fixtures shall be of the correct length to uniformly maintain the fixture heights shown on the drawings. Variation in mounting individual fixtures shall not exceed 1/4 inch. Height shall not vary more than 1/2 inch from the floor mounting height shown on the drawings. Fixtures hung in continuous runs shall be installed absolutely level and in line with each other. Hanging devices shall comply with Code requirements. Use single stem hangers (double stem hangers shall not be acceptable). Threaded rods shall be used to support lighting fixtures in those spaces where no other means of support is attainable, and only if fixtures are installed absolutely level with no looseness for movement, and only if approved by Code.
11. Rigidly align continuous rows of lighting fixtures for true in-line appearance, subject to the Architect's and the Lighting Designer’s approval.
12. Install pendant lighting fixtures plumb and at a height from the floor as specified or indicated on the drawings. In cases where conditions make this impractical, refer to the Architect and the Lighting Designer and install as directed. Use ball aligners and canopies on pendant fixtures unless noted otherwise.
13. Do not install fixtures and/or parts such as finishing plates and trims for recessed fixtures until all plastering and painting that may mar fittings finish has been completed.
14. Housings shall be rigidly installed and adjusted to a neat flush fit with the ceiling or other finished mounting surface.
15. The housings of recessed lighting fixtures shall be adequately protected during installation.

16. Install reflector cones, baffles, aperture plates, light controlling element for air handling fixtures, and decorative elements after completion of ceiling tiles, painting and general cleanup.
17. All adjustable and aimable fixtures shall have final adjustment and aiming performed in the presence of and per the direction of the Architect and the Lighting Designer.
18. Replace blemished, damaged, or unsatisfactory fixtures as directed by the Architect and/or the Lighting Designer.
19. Exterior poles, bases and any other fixture or fixture components with scratched or damaged finish shall be repainted to match specified color. Pole mounted fixtures shall be provided with inline fuses located in base.
20. Any lamps, drivers, reflectors, lenses, diffusers, side panels or other parts damaged prior to the final inspection shall be replaced at no expense to the Owner.
21. At time of final inspection, all fixtures and equipment shall be fully lamped, and shall be complete with required lenses or diffusers, reflectors, side panels, louvers, or other necessary components.
22. Each lighting fixture shall be packaged with complete instructions and illustrations showing how to install. Install lighting fixtures in strict conformance with manufacturer's recommendation and instructions.
23. Provide fixtures constructed, wired, and installed in compliance with the current edition of applicable City, State and National Codes. Provide fixtures conforming to UL Standards, and to provisions of applicable Codes which exceed those Standards. In addition, provide fixtures which conform to additional Regulations necessary to obtain approval for use of specified fixtures in locations shown. Use only electrical components that are UL listed.
24. Particular attention is called to Article 410 of the NEC. Provide only fixtures that meet these requirements, as interpreted by local agencies. As manufacturers' catalogue umbers may not include thermal protection devices, it is Contractor's responsibility to coordinate the fixture provided with the ceiling construction in accordance with Local Code enforcement practice.
25. Mounting of all lighting fixtures shall conform to seismic requirements.

3.3 MATERIALS AND WORKMANSHIP

A. All materials and equipment shall be new and unused and shall meet requirements of the latest Standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA, applicable NFPA documents and shall be UL listed and labeled.

B. Despite references in the specifications or on the drawings to materials or pieces of equipment by name, make or catalog number, such references shall be interpreted as establishing standards of quality for materials and performance.

C. Finish of materials, components and equipment shall not be less than Industry good practice. When a material or equipment is visible or subject to corrosive or atmospheric conditions, the finish shall be as approved by the Architect and the Lighting Designer.

D. Provide proper access to material or equipment that requires inspection, replacement, repair, or service. If proper access cannot be provided, confer with the Architect and the Lighting Designer as to the best method of approach to minimize effects of reduced access.

E. All work shall be installed in a neat and workmanlike manner and shall be done in accordance with all Local and State Codes.

F. The Owner will not be responsible for material, equipment, or the installation of the same before testing and acceptance.

3.4 CLEANING AND PROTECTION

A. Clean off excess debris, paint spills, construction materials from adjacent work as construction progresses by methods and with cleaning materials that are approved by each of the manufacturers and that do not damage lighting fixtures or accessories.

B. Provide protection to the completed work and equipment and maintain clean conditions during and after installation to ensure that lighting fixtures are not damaged at time of Substantial Completion. If damage or deterioration occurs despite such protection, the Contractor shall remove damaged lighting fixtures immediately and install new lighting fixtures, at no cost to the Owner, per the specified requirements.

3.5 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

A. The Contractor shall prepare and issue, to the Owner's Maintenance Department representative, three (3) copies of all the installed lighting fixture manufacturers labeled per the construction documents, including manufacturer representative contact information, lamp specifications, equipment cuts, wiring diagrams, dimming and control systems information covering all lighting systems installed under this section. The material shall be bound in notebook form and indexed.

B. In addition, prior to substantial completion, the Contractor shall give detailed instructions and explanation of the maintenance manual and in the operation and maintenance of all work installed under this section to the Owner's Maintenance Department representative.

END OF SECTION

SECTION 270500 – COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY:

A. Scope: Extent of communications systems work is indicated by drawings, specifications, and details, and as hereby defined to include, but not be limited to telephone, data, and CATV conduits, boxes, terminals, and other associated equipment and hardware.

B. Provide submittals on all products specified with this section.

C. All cabling materials, cabling, ends, jacks, patch panels, racks, etc. will be provided and installed by the Owners installers, unless otherwise noted on the drawings or in the specifications. Additional and or more stringent requirements may be found in other communication specification sections and shall be applicable to this Project. All raceways associated with communication and cabling systems shall be installed by contractor.

D. Installation of raceways, conduit sleeves etc. as required for routing of communication systems cabling shall be per specifications Section 26 05 33 “Raceway Systems”.

1.2 QUALITY ASSURANCE:

A. Installers Qualifications: Firms with at least five (5) years successful installation experience with projects utilizing telephone, data, video, fire alarm, nurse call and other communication systems and wiring similar to that required for this project. To ensure data distribution system is Category 6 compliant, installer must be a Building Industry Consulting Service International (BICSI) member and have a data cable certification by AT&T.

B. The Contractor shall provide three (3) previous references of cabling installations for each type included in this project.

C. Codes and Standards: Conform to the following:
   1. Codes Rules and Regulations: Execute all work under ADA, the latest rules and regulations of the National Electrical Code Standard of the national Board of Fire Underwriters, the National Fire Protection Association, and with all laws, regulations and ordinances of the County, State and city.
   2. Federal Communications Commission (FCC): Comply with Federal Communications Commission Rules, pertaining to telephone equipment and other communication systems being installed.
   3. Institute of Electrical and Electronics Engineers (IEEE): Comply with IEEE Recommended Practice for electric Power Systems in Commercial Buildings: pertaining to communication systems and Local Area Networks.
   4. National Electrical Manufacturers Association (NEMA): Comply with NEMA requirements for "Enclosures for Electrical Equipment”.

5. Rural Electrification Administration (REA): Comply with Rural Electrification Administration specifications pertaining to construction and installation of telephone cabling.
6. Electronic Industries Association (EIA): Comply with EIA Standards and EIA/TIA (Telecommunications Industries Association) Standards for Commercial Building Telecommunication Wiring, pertaining to categorizing and installation of telephone and data systems.
7. Underwriters Laboratories (UL): All equipment shall be U.L. listed and installed to maintain such listings.

1.3 DELIVERY, STORAGE, AND HANDLING:

A. Delivery: Deliver communication system equipment and components in factory-fabricated containers or wrappings, which properly protect equipment from damage.

B. Storage: Store communication system equipment and components in original packaging. Store inside in a well-ventilated space protected from weather, moisture, soiling, humidity, and extreme temperatures.

C. Handling: Handle communication system equipment and components carefully to prevent damage, breaking, and scoring of finishes. Do not install damaged units or components; replace with new.

1.4 COORDINATING AND SEQUENCING:

A. Coordinating: Coordinate with other building trades and electrical work including wires/cables, electrical boxes and fittings, and raceways, to properly interface installation of systems with other work.

B. Sequencing: Sequence installation of communication systems with other work to minimize possibility of damage and soiling during remainder of construction.

C. Contractor will be responsible for ceiling tile replacement, wall repainting, etc. Due to damage caused by installation of this equipment and cabling.

1.5 AS-BUILT DRAWINGS:

A. Show on blue line prints in red ink all telephone, data, video, CATV jack identification numbers, actual cable routing paths, as well as all changes from original plans made during the installation. Separate As-Built drawings shall be provided for each communication system installed. Return the “as-built” red lined drawings, specifications and addenda, as set forth in the General conditions, to the Architect/Engineer upon completion of the project.

1.6 MEASUREMENTS AND LAYOUTS

A. The Drawings are schematic in nature but show the various components of the systems approximately to scale and attempt to indicate how they are to be integrated with other parts of the Work. Figured dimensions take precedence to scaled dimensions. Determine exact locations

by job measurements, by checking the requirements of other trades, and by reviewing all Contract Documents. Correct, at no additional costs to the Owner, errors that could have been avoided by proper checking and inspection.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Accessories:

1. Backboards shall be provided as shown on the drawings or in the Specifications. Interconnect locations will require this Contractor to install additional Backboards. If interconnect locations are required, they must be approved by the Engineer/Owner prior to installation. Verify in Field exact quantity needed. Backboards shall be 3/4" thick fire resistant plywood with size as required for installation. Plywood shall be painted with two (2) coats of high fire resistant, non conductive white paint. As a minimum provide backboards as indicated on the drawings or in the Specifications.
2. Raceways: All communications cabling shall be installed in raceway systems when located in concealed, non accessible locations. In general, raceways are required for outlets in walls up into accessible ceilings, through non accessible ceilings, and through all wall penetrations etc. Provide bushings at all raceway terminations. Fire stop and fire seal all penetrations of fire rated walls.
3. Cable Supports: All cables above ceilings are to be supported by and/or J-Hooks located approximately 6” above lay-in ceilings below all mechanical and other electrical equipment.
    a. Contractor shall install cabling to maintain a twelve (12) inch minimum distance from all sources of Electrical Magnetic Interference (EMI), such as; fans, motors, fluorescent fixtures, transformers, etc. Engineer shall be notified in advance if these clearances cannot be met. Power cable must never reside in the same cable tray as the data cabling. No data cables will be spliced. Specifically all cabling installation procedures will also adhere to the recommended “do’s and Don’ts in EIA/TIA 568B.
    b. J-Hooks: J-Hooks shall be used in common areas where cable trays are not available and/or as indicated on the plans. J-Hooks shall be located 6” maximum above ceilings with a maximum spacing of 4’-0” on center. J-Hook must be sized to support all cable plus 15% room for additional cable in the future. All hardware shall be submitted for approval to Engineer prior to installation
    c. "D" Rings: “D” rings may be used in common areas in place of J-Hooks following the same installation requirements. "D" rings are to be provided to support all voice and data cables in telephone communications rooms, 6" on center maximum. “D” ring numbers 13A,B, and C. Size as required.
    d. Conduit Sleeves: Conduit sleeves shall be one of the following:
        1) Rigid steel or IMC conduit with threaded ends and non-metallic bushings on each end.
        2) EMT conduit with U.L. Listed slide on non-metallic bushings on each end.

        Conduit sleeves shall be provided where cables are indicated to pass through walls and at other locations as indicated on the plans. Sleeves shall be 1” conduit minimum extending 6” on either side of walls. Where possible, sleeves shall be located 6” above ceiling.

e. Tie-Wraps: Thomas & Betts, TY-RAPS© brand. Will be plastic, heavy duty, and flame retardant (Must meet UL 94V-O flammability rating). Size as required. (Thomas & Betts Bulk Pkg. Cat. Number TY28MFR)

f. Cable Labels: A quality grade general purpose vinyl-impregnated waterproof tape. Resistant to moderate amounts of oil, dirt, and temperature ranges from -30°F to 200°F. (Thomas & Betts, E-Z-Code© WBC vinyl cloth, standard Cat. No. WM-A-Z)

4. Cable Management:
   a. Telephone terminal backboards shall be provided with standard cable management rings and wire-ways to support the cabling, as shown on project drawings. Cable management shall be used for both the vertical and horizontal cabling on the backboard. The quantity of cable management rings and wire-ways shall be based upon the cable size and number of 66 type blocks. Cable management rings and wire-ways shall not exceed 60 percent fill.
5. Cable Labeling:
   a. Labeling of cable shall consist of permanent lettering or numbering as required by owner to coordinate with existing labeling schemes. Contractor to coordinate exact labeling of cables with Owner.
6. Documentation:
   a. All cables will be labeled in accordance with current VCRMC labeling standards.
   b. All cables will be appropriately labeled on both ends, in all junction boxes and at 50’ intervals.
   c. No data cabling identifier will duplicate any previous, active cable identifier.
   d. Additional cable labeling may be required in the individual communication system specification sections.

B. Tightening: Tighten electrical connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors.

C. Provide pathways for telecommunications to allow cabling to be installed for phone and data lines to all emergency phones, area of refuge phones, elevator equipment rooms and fire alarm panels. Provide cross-connect wires as indicated on the drawings and as required to form a complete and functioning telecommunications system. This includes extension of analog voice lines from the service provider demarcation point to the following connections:
   1. Fire Alarm Control Panels
   2. Elevator phones

2.2 GROUNDING:

A. General: Provide #6 CU. equipment grounding connections for Cabling Blocks, patch panels, racks, metal troughs, protectors, etc. to grounding bus. Provide ground bus and ground cable to common ground plan, and driven ground rods for a max. impedance of 5 ohms. All communication systems shall be grounded in compliance with ANSI/NFPA 70 requirements and practices, except where superseded by other authorities or codes. These grounding requirements apply to all cross-connect frames, patch panel racks, active communication system equipment and test apparatus used for maintenance and testing.

2.3 TELEPHONE SYSTEM:

A. Outlets: All telephone outlet boxes shall be installed with 4" square, minimum 2 1/8" deep box and trim. Telephone coverplates to be as furnished by telephone system supplier unless noted otherwise on the drawings. All floor outlets shall be adjustable water-tight floor box, per Section 16110. All telephone outlet boxes to be located as directed. Telephone outlet boxes not used shall be provided with blank cover plates to match switch and receptacle plates.

B. Each telephone outlet box location requires (1) 1" empty conduit with pull wire unless noted otherwise. Where combination telephone/data outlets are noted on the drawings, provide only one 1” empty conduit with pull wire, unless noted otherwise on the drawings. Telephone conduits shall be stubbed into ceiling void, if entire ceiling void is accessible and not an air return plenum. Install insulated bushing on end of conduit in ceiling voids. Telephone conduits shall be routed to the telephone terminal board if ceiling void is not accessible, is an air return plenum, or ceiling void is not accessible for full distance to the telephone terminal board. Install insulated bushing on end of conduit at terminal board. Verify conditions of job prior to rough-in.

C. The Telephone system shall be provided with a 2" minimum main service conduit from the Telephone terminal board to the property line unless a larger size is noted otherwise on the drawings or required by the Telephone company. Conduit to be routed per the requirements of the serving Telephone company. Verify conduit size with Telephone company prior to installation.

D. Provide duplex receptacle on separate circuit beside each telephone terminal board location and other communications equipment requiring 120 volt power.

2.4 DATA OUTLET SYSTEM:

A. Section 2.5 will only apply if there are data outlets shown on the drawings.

B. Outlets: All data outlet boxes shall be installed with 4" square, minimum 2 1/8" deep box and trim. Coverplates to be as furnished by data system supplier unless noted otherwise on the drawings. All floor outlets shall be adjustable water-tight floor box, per Section 16110. All data outlet boxes to be located as directed. Data outlet boxes not used shall be provided with blank cover plates to match switch and receptacle plates.

C. Each data outlet box location requires (1) 1" empty conduit with pull wire unless noted otherwise. Where combination telephone/data outlets are noted on the drawings, provide only one 1” empty conduit with pull wire, unless noted otherwise on the drawings. Data conduits shall be stubbed into ceiling void, if entire ceiling void is accessible and not an air return plenum. Install insulated bushing on end of conduit in ceiling voids. Data conduits shall be routed to the data terminal board if ceiling void is not accessible, is an air return plenum, or ceiling void is not accessible for full distance to the data terminal board. Install insulated bushing on end of conduit at terminal board. Verify conditions of job prior to rough-in.

D. Provide data terminal board as shown on the drawings or as required by data system supplier. Board shall be 3/4" fire resistant plywood sized as required by data system supplier, minimum 4' x 4'. Unless shown otherwise on the drawings, data terminal board to be mounted on wall

adjacent to telephone terminal board and painted with two coats of fire resistant non-conductive paint, color as selected by Architect.

E. Provide duplex receptacle on separate circuit beside each data terminal board location and other communications equipment requiring 120 volt power.

2.5 CATV (TELEVISION) OUTLET SYSTEM:

A. Section 2.3 will only apply if there are CATV outlets shown on the Drawings.

B. Outlets: All CATV outlet boxes shall be installed with 4" square, minimum 2 1/8" deep box and trim, with separately mounted 20 amp 125 volt duplex grounded receptacle adjacent to CATV outlet. CATV coverplates to be as furnished by CATV system supplier unless noted otherwise on the drawings. All floor outlets shall be adjustable water-tight floor box, per Section 16110. All CATV outlet boxes to be located as directed. CATV outlet boxes not used shall be provided with blank cover plates to match switch and receptacle plates.

C. Each CATV outlet box location requires (1) 1" empty conduit with pull wire unless noted otherwise. CATV conduits shall be stubbed into ceiling void, if entire ceiling void is accessible and not an air return plenum. Install insulated bushing on end of conduit in ceiling voids. CATV conduits shall be routed to the CATV terminal board if ceiling void is not accessible, is an air return plenum, or ceiling void is not accessible for full distance to the CATV terminal board. Install insulated bushing on end of conduit at terminal board. Verify conditions of job prior to rough-in.

D. The CATV system shall be provided with a 2" minimum main service conduit from the CATV terminal board to the property line unless a larger size is noted otherwise on the drawings or required by the CATV company. Conduit to be routed per the requirements of the serving CATV company. Verify conduit size with CATV company prior to installation.

E. Provide CATV terminal board as shown on the drawings or as required by CATV system supplier. Board shall be 3/4" fire resistant plywood sized as required by CATV system supplier, minimum 2' x 2'. Unless shown otherwise on the drawings, CATV terminal board to be mounted on wall adjacent to telephone terminal board and painted with two coats of fire resistant non-conductive paint, color as selected by Architect.

F. Provide duplex receptacle on separate circuit beside each CATV terminal board location and other communications equipment requiring 120 volt power.

2.6 ADJUSTING AND CLEANING:

A. Cleaning: Clean all equipment and components of dirt and construction debris upon completion of installation.

B. Touch-up: Touch-up scratched or marred enclosure surfaces to match original finishes.

C. Protection: Protect installed equipment, cabling and components from damage during remainder of construction period.

2.7 DEMONSTRATION/TESTING:

A. Testing of each system shall be performed in accordance with the manufacturers specifications and as outlined in the other individual communication system specification sections.

PART 3 - EXECUTION

3.1 PROJECT OVERVIEW:

A. Scope: Extent of communications systems work is indicated by drawings, specifications, and details, and as hereby defined to include, but not be limited to telephone, data, and CATV conduits, boxes, terminals, and other associated equipment and hardware.

B. All cabling materials, cabling, ends, jacks, patch panels, racks, etc. will be provided and installed by the Owners installers, unless otherwise noted on the drawings or in the specifications. Additional and or more stringent requirements may be found in other communication specification sections and shall be applicable to this Project. All raceways associated with communication and cabling systems shall be installed by contractor.

C. Installation of raceways, conduit sleeves etc. as required for routing of communication systems cabling shall be per specifications Section 26 05 33 “Raceway Systems”.

D. Installation:
1. Horizontal through-wall conduits and sleeves shall be provided for cabling runs as required and indicated on the plans. Contractor is to ensure grommets and/or bushings are installed on all conduits prior to cable pull. Where there is no existing vertical conduit and gangbox - Surface mounted gangbox and wiremold stubbed 6 inches above the finished ceiling shall be installed in each area requiring a system device or outlet upon approval of engineer/Owner. J-Hooks suspended above ceiling cavity or wall mounted “D” rings shall be installed by this Contractor to extend out of the Equipment Rooms into the ceiling cavity to hold the large bundles of horizontal cabling where cable trays are not being used.
2. At all times, the communication cable shall be at least twelve (12”) away from all lighting and other line voltage circuits, shall not run parallel to electrical utilities in close proximity, shall cross electrical utilities at right angles with at least twelve (12”) of separation. Engineer shall be notified in advance if these clearances cannot be met.

E. Examination:
1. General: Examination areas and Conditions under which systems are to be installed. Notify the General Contractor or Engineer in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

F. Installation of communications systems:
1. Installation: Install cables as indicated, in accordance with manufacturer's written instructions and with recognized industry practices. Ensure cables comply with

installation and operational requirements of EIA/TIA, NEC, the Federal Communications Commission and all other applicable codes governing the cables being installed.

2. All communications system cables shall be independently supported on 'J' hooks, or in cable trays if indicated on the drawings. Do not support cables from mechanical ductwork, piping, ceiling system wires, electrical conduits, etc.

G. Installation of J-hooks:
   1. Provide J-Hook supports from the structure above for all horizontal runs except where cables are run in cable trays. Spacing shall be a maximum of 4’-0”. Cables shall be located approximately 6” above the ceiling. Cable shall not contact the ceilings, piping, light fixtures, ducts, etc. All cables must be suspended independently from other supports.

H. Installation of tie wraps:
   1. Tie-wrap all cables (except patch cords) together between the J-Hooks, in the cable trays, and in the communications rooms. Spacing shall be a maximum of 4’-0”. No tie-wraps shall be placed over cable labels. The Tie-wraps shall be plastic, heavy duty, and flame retardant.

I. Wall penetrations:
   1. When cables pass through walls, conduit sleeves shall be provided. Provide fire barrier around conduit and seal conduit with fire barrier after cable installation in fire rated walls.

J. Interconnection to Owner equipment:
   1. All interconnections between premise cabling and equipment (either existing or new) shall be coordinated with Owner to minimize any downtime as related to the associated communications system.

END OF SECTION

SECTION 271300 – COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY:

A. Scope: Extent of communications systems work is indicated by drawings, specifications, and details, and as hereby defined to include, but not be limited to telephone, data, and CATV conduits, boxes, terminals, and other associated equipment and hardware.

B. Provide submittals on all products specified with this section.

C. All cabling materials, cabling, ends, jacks, patch panels, racks, etc. will be provided and installed by the Owners installers, unless otherwise noted on the drawings or in the specifications.

1.2 QUALITY ASSURANCE:

A. Codes and Standards: Conform to the following:
   1. National Electrical Code (NEC): comply with applicable local code requirements of the authority having jurisdiction and NEC.
   2. This installation must be done according to the requirements of the local system supplier and the general specifications contained herein. Consult the serving installers to verify all requirements.

PART 2 - PRODUCTS

2.1 TELEPHONE SYSTEM:

A. Outlets: All telephone outlet boxes shall be installed with 4" square, minimum 2 1/8" deep box and trim. Telephone coverplates to be as furnished by telephone system supplier unless noted otherwise on the drawings. All floor outlets shall be adjustable water-tight floor box, per Section 260533. All telephone outlet boxes to be located as directed. Telephone outlet boxes not used shall be provided with blank cover plates to match switch and receptacle plates.

B. Each telephone outlet box location requires (1) 1" empty conduit with pull wire unless noted otherwise. Where combination telephone/data outlets are noted on the drawings, provide only one 1” empty conduit with pull wire, unless noted otherwise on the drawings. Telephone conduits shall be stubbed into ceiling void if entire ceiling void is accessible and not an air return plenum. Install insulated bushing on end of conduit in ceiling voids. Telephone conduits shall be routed to the telephone terminal board if ceiling void is not accessible, is an air return plenum, or ceiling void is not accessible for full distance to the telephone terminal board. Install insulated bushing on end of conduit at terminal board. Verify conditions of job prior to rough-in.

C. Provide telephone terminal board as shown on the drawings or as required by telephone system supplier. Board shall be 3/4" fire resistant plywood sized as required by telephone system supplier, minimum 4' x 4'. Telephone terminal board to be mounted on wall and painted with two coats of fire-resistant non-conductive paint, color as selected by Architect.

D. The Telephone system shall be provided with a 2" minimum main service conduit from the Telephone terminal board to the property line unless a larger size is noted otherwise on the drawings or required by the Telephone company. Conduit to be routed per the requirements of the serving Telephone company. Verify conduit size with Telephone company prior to installation.

E. Provide duplex receptacle on separate circuit beside each telephone terminal board location and other communications equipment requiring 120-volt power.

2.2 DATA OUTLET SYSTEM:

A. Section 2.2 will only apply if there are data outlets shown on the drawings.

B. Outlets: All data outlet boxes shall be installed with 4" square, minimum 2 1/8" deep box and trim. Coverplates to be as furnished by data system supplier unless noted otherwise on the drawings. All floor outlets shall be adjustable water-tight floor box, per Section 260533. All data outlet boxes to be located as directed. Data outlet boxes not used shall be provided with blank cover plates to match switch and receptacle plates.

C. Each data outlet box location requires (1) 1" empty conduit with pull wire unless noted otherwise. Where combination telephone/data outlets are noted on the drawings, provide only one 1” empty conduit with pull wire, unless noted otherwise on the drawings. Data conduits shall be stubbed into ceiling void if entire ceiling void is accessible and not an air return plenum. Install insulated bushing on end of conduit in ceiling voids. Data conduits shall be routed to the data terminal board if ceiling void is not accessible, is an air return plenum, or ceiling void is not accessible for full distance to the data terminal board. Install insulated bushing on end of conduit at terminal board. Verify conditions of job prior to rough-in.

D. Provide data terminal board as shown on the drawings or as required by data system supplier. Board shall be 3/4" fire resistant plywood sized as required by data system supplier, minimum 4' x 4'. Unless shown otherwise on the drawings, data terminal board to be mounted on wall adjacent to telephone terminal board and painted with two coats of fire-resistant non-conductive paint, color as selected by Architect.

E. Provide duplex receptacle on separate circuit beside each data terminal board location and other communications equipment requiring 120-volt power.

2.3 CATV (TELEVISION) OUTLET SYSTEM

A. Section 2.3 will only apply if there are CATV outlets shown on the Drawings.

B. Outlets: All CATV outlet boxes shall be installed with 4" square, minimum 2 1/8" deep box and trim, with separately mounted 20-amp 125-volt duplex grounded receptacle adjacent to

CATV outlet. CATV coverplates to be as furnished by CATV system supplier unless noted otherwise on the drawings. All floor outlets shall be adjustable water-tight floor box, per Section 260533. All CATV outlet boxes to be located as directed. CATV outlet boxes not used shall be provided with blank cover plates to match switch and receptacle plates.

C. Each CATV outlet box location requires (1) 1" empty conduit with pull wire unless noted otherwise. CATV conduits shall be stubbed into ceiling void if entire ceiling void is accessible and not an air return plenum. Install insulated bushing on end of conduit in ceiling voids. CATV conduits shall be routed to the CATV terminal board if ceiling void is not accessible, is an air return plenum, or ceiling void is not accessible for full distance to the CATV terminal board. Install insulated bushing on end of conduit at terminal board. Verify conditions of job prior to rough-in.

D. The CATV system shall be provided with a 2" minimum main service conduit from the CATV terminal board to the property line unless a larger size is noted otherwise on the drawings or required by the CATV company. Conduit to be routed per the requirements of the serving CATV company. Verify conduit size with CATV company prior to installation.

E. Provide CATV terminal board as shown on the drawings or as required by CATV system supplier. Board shall be 3/4" fire resistant plywood sized as required by CATV system supplier, minimum 2' x 2'. Unless shown otherwise on the drawings, CATV terminal board to be mounted on wall adjacent to telephone terminal board and painted with two coats of fire-resistant non-conductive paint, color as selected by Architect.

F. Provide duplex receptacle on separate circuit beside each CATV terminal board location and other communications equipment requiring 120-volt power.

PART 3 - EXECUTION

A. Provide and install nylon pull wires in all Communication Systems conduits. Provide tags on all pull wires to indicate termination of wire or conduit.

B. Provide and install pull boxes at all locations as required by the Communication Systems system supplier.

C. Provide and install conduit sleeves thru floors and walls as required by the Communication Systems system supplier. Vertical conduits/sleeves through closets floors shall terminate not less than 3-inches above the floor and not less than 3-inches below the ceiling of the floor below.

D. All conduit ends shall be equipped with non-metallic insulated bushings.

E. Terminate conduit runs to/from the associated telephone, data, or CATV backboard in a closet or designated space at the top or bottom of the backboard. Conduits shall enter closets next to the wall and be flush with the backboard.

F. Where drilling is necessary for vertical conduits, locate holes so as not to affect structural sections such as ribs or beams.

G. All empty conduits located in equipment closets or on backboards shall be sealed with a standard non-hardening duct seal compound to prevent the entrance of moisture and gases and to meet fire resistance requirements.

H. Conduit runs shall contain no more than four quarter turns (90-degree bends) between pull boxes/backboards.

END OF SECTION

SECTION 31 10 00 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing site utilities.
7. Temporary erosion- and sedimentation-control measures.

1.2 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials, including excess stripped topsoil, shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises, coordinate with Owner.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Contractor is to visit site and acquaint himself with all conditions above and below grade that might affect new construction. Discovery of any conditions hindering construction before or during the construction process shall not be cause for claims due to unforeseen conditions.

E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

D. Verify that existing plant life designated to remain is tagged or identified.

E. Identify DESIGNATED AREAS for placing removed materials.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to requirements in Section 01 56 39 "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.5 CLEARING AND GRUBBING

A. Remove completely all stumps, obstructions, shrubs, buried logs, brush, grass, and other vegetation to permit installation of new construction.

1. Remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
2. Use only hand methods for grubbing within protection zones.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to minimum to depth of 6-inches or deeper if required in a manner to prevent intermingling with underlying subsoil or other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 PAVEMENT REMOVAL

A. Remove existing P.C. concrete paving and asphaltic paving to permit installation of new construction.

B. Damage to adjacent pavement:

1. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement. Repair to damaged will be at the contractor's expense.

3.8 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00

SECTION 31 20 00 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing subgrades for walks, pavements, lawn, turf and grasses, and plants.
2. Preparing subgrades for slabs-on-grade if not specified in the structural drawings.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Base course for concrete walks, and pavements.
6. Excavating and backfilling for utility trenches.

1.2 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill, subgrade as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698.

1.3 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subgrade and bottom of cement concrete paving or cement concrete walk.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill. Refer to Structural Fill for borrow soil at Structures.

E. Stabilized Soil: Existing soil which is scarified, moisture conditioned, and recompacted.

F. Controlled Low-Strength Material (CLSM): Low strength flowable fill used as backfill.

G. Drainage Course or Granular Base: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

H. Embedment Material: Trench backfill material above the bedding to the pipe springline.

I. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

J. Fill: Soil materials used to raise existing grades.

K. Gravel: Limestone aggregate surface layer.

L. Standard Backfill Material: Trench backfill material above the pipe springline to 12-inches above top of pipe or the final subgrade.

M. Structural Fill: Fill soils classified as Structural Fill from excavations or imported from off-site for use below structures.

N. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

O. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below base, drainage course, or topsoil materials.

P. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 PROJECT CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

B. Do not commence earth moving operations until plant-protection are in place as indicated.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: 35 maximum.
2. Plasticity Index: 5 to 15

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 3 percent of optimum moisture content at time of compaction.

D. Base Course: Non-recycled limestone aggregate meeting Oklahoma Department of Transportation (ODOT) 2019 Specification Section 703 and Table 703.1 Type "A" Aggregate.

E. Structural Fill: Non-expansive fill meeting the following requirements

1. Free of organic or other deleterious material
2. Amount passing 2" sieve: 100%
3. Amount passing 1-1/2" sieve: 90%
4. Amount passing No. 200 sieve: 12% minimum, and if PI is less than 7, 60% maximum.
5. Liquid Limit: 35 maximum
6. Plasticity Index (PI): 5 to 15.

F. Bedding Course:

1. Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a sieve; or Aggregate meeting Oklahoma Department of Transportation (ODOT) 2009 Specification Section 703 and Table 703.1 Type "A" Aggregate, or if trench is wet, ASTM C33: No. 67 aggregate.

G. Embedment Material: ASTM C33: No. 8 or No. 67 aggregate, or Aggregate meeting Oklahoma Department of Transportation (ODOT) 2009 Specification Section 703 and Table 703.1 Type "A" Aggregate, or CLSM for gravity pipe only.

H. Controlled Low-Strength Material: A low strength grout backfill meeting Oklahoma Department of Transportation (ODOT) 2009 Specification Section 701.19.

I. Standard Backfill Material: Aggregate meeting Oklahoma Department of Transportation (ODOT) 2009 Specification Section 703 and Table 703.1 Type "A" Aggregate, or CLSM for gravity pipe only (allowed only if embedment material is CLSM)

J. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

K. Gravel: 1-1/2-inch limestone crusher run

2.2 ACCESSORIES

A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.

B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deletrerious materials from ground surface is specified in Division 31 10 00 "Site Clearing".

D. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: **As indicated**.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes, conduit, and bedding. Shape subgrade and bedding to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.

3.6 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck with a minimum rear axle load of approximately 16,000-pounds to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Remove soft subgrade up to 3-feet below final top of subgrade elevation, but not below static groundwater elevation.
      a. If aerating and recompacting soft areas is inadequate and Architect determines that unsatisfactory soil is present or if such a depth is reached without encountering stable subgrade conditions; with Architect approval, 12-inches of base material shall be placed in bottom of the over-excavated area and structural fill material placed and compacted to bring the subgrade to design elevation.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings with lean concrete fill, with 28-day compressive strength of 2500 psi.

   1. Fill unauthorized excavations under other construction, pipe, paving, or conduit as directed by Architect.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with structural fill; fill with concrete to elevation of bottom of footings. Concrete is specified in "Cast-in-Place Concrete."

D. Trenches under Gravel Surfaces and Paved Areas: Where top of piping or conduit is less than 18-inches below gravel surfaces or 12-inches below bottom of paved areas, completely encase piping or conduit in a minimum of 4-inches of concrete before backfilling or placing final backfill. Concrete is specified in "Cast-in-Place Concrete."
   1. Place and compact final backfill of standard backfill material.

E. Trenches under non-graveled and unpaved areas: Where top of piping or conduit is less than 12 inches below finish grade, completely encase piping or conduit in a minimum of 4-inches of concrete before backfilling or placing final backfill. Concrete is specified in "Cast-in-Place Concrete."
   1. Place and compact final backfill material of satisfactory soil or excavated materials free of particles larger than 1 inch in any dimension to final subgrade.

F. Trenches under gravel surface and paved areas where pipe or conduit is greater than 18-inches below gravel surfaces or 12-inch below bottom of paved areas:
   1. Place and compact bedding material at bottom of suitable trench foundation.
   2. Place and compact haunch backfill with embedment material, to pipe springline.
      a. Carefully compact haunch backfill evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
   3. Place and compact standard backfill material backfill to final subgrade.

G. Trenches under non-graveled surface and unpaved areas where pipe or conduit is greater than 12-inch below finish grade:
   1. Place and compact bedding material at bottom of suitable trench foundation.
   2. Place and compact haunch backfill with embedment material, to pipe springline.
      a. Carefully compact haunch backfill evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
   3. Place and compact initial backfill of satisfactory soil,
   4. Place and compact final backfill of satisfactory materials or excavated materials free of particles larger than 1 inch in any dimension to final subgrade.

H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

   1. Under grass and planted areas, use satisfactory soil material.

2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use structural fill.
4. Under building slabs, use structural fill.
5. Under footings and foundations, use structural fill.

3.11 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 0 percent and plus 3 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures, and building slabs, scarify and recompact top 8 inches of existing subgrade at 95 percent, and each layer of backfill or fill soil material at 95 percent.
2. Under steps, and pavements, scarify and recompact top 8 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
3. Under walkways, scarify and recompact top 8 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
4. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 90 percent.
5. For utility trenches at gravel surfaces, paved areas, sidewalks, structures, and building slabs, compact each layer of initial and final backfill soil material at 95 percent.
6. For utility trenches at lawn or unpaved areas, compact each layer of initial and final backfill soil material at 85 percent.

3.13 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.14 BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place base course under pavements and walks as follows:

1. Shape base course to required crown elevations and cross-slope grades.
2. Place base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
3. Compact base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Perform compaction density testing on compacted soils/fill in accordance with ASTM D 1556, ASTM D 2167, ATM D2992, or ASTM D 2937, as applicable.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

F. Testing Requirements:

1.	Existing Subgrade Areas:	1 per 10,000 S.F. of existing subgrade Minimum (3)
2.	Building Pad Areas:	1 per 1,000 S.F. per lift of fill placed, minimum (3)-per lift
3.	Gravel Surface and Paved Areas:	1 per 10,000 S.F. per lift of fill placed minimum (3)-per lift
4.	Random fill (non-load bearing):	1 per 40,000 S.F. of fill placed
5.	Utility trenches:	1 per 200 C.Y. of fill placed

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

SECTION 33 10 00 - WATER UTILITIES

PART 1 - GENERAL

1.1 DESCRIPTION:

Underground water distribution system complete, ready for operation, including all appurtenant structures, and connections to new building service lines and to existing water supply.

1.2 RELATED WORK & DOCUMENTS:

A. Excavation, trench widths, pipe bedding, backfill, shoring, sheeting, bracing: Section 31 20 00, EARTH MOVING.

B. Concrete: Section 03 30 53, CAST-IN-PLACE CONCRETE.

D. Oklahoma Department of Environmental Quality (ODEQ) rules and regulations Oklahoma Administrative Code (OAC) 252:626-19

1.3 DEFINITIONS:

A. Water Distribution: Pipelines and appurtenances which are part of the distribution system. The distribution system comprises the network of piping located throughout building areas and other areas of water use, including hydrants, valves, and other appurtenances used to supply water for domestic and fire-fighting/fire protection purposes.

B. Water Service Line: Pipe line connecting building piping to water distribution lines.

1.4 QUALITY ASSURANCE:

A. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to Public Water lines and the extension, and/or modifications to Public Utility systems.

B. Comply with all rules and regulations of Federal, State, and Department of Environmental Quality. Having jurisdiction over the design, construction, and operation of potable water systems.

C. All material surfaces in contact with potable water shall comply with NSF 61.

1.5 SUBMITTALS:

A. Submit SHOP DRAWINGS, PRODUCT DATA and SAMPLES.

B. Manufacturers' Literature and Data submit all items as one package:
Ductile Iron Pipe and Polyvinyl Chloride (PVC) shall be in accordance with AWWA C600 and C605 respectively; and shall be provided to the Engineer for approval.

1. Piping.
2. Valves.
3. Fire hydrants.
4. Meter.
5. Vaults, frames and covers.
6. Steps.
7. Valve boxes.
8. Corporation and curb stops.
9. Curb stop boxes.
10. Joint restraint.
11. Link/sleeve seals.

C. Testing Certifications:

1. Certification of Backflow Devices.
2. Hydrostatic Testing.
3. Certification of Disinfection, including free chlorine residuals, and bacteriological examinations.

1.6 APPLICABLE PUBLICATIONS:

A. The publications (using latest edition as of project date) listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. American National Standards Institute (ANSI/ASME):

B16.1 ..... Cast Iron Pipe Flanges and Flanged Fittings
B16.18 ..... Cast Bronze Solder Joint Pressure Fittings
B16.26 ..... Cast Copper Alloy Fittings for Flared Copper Tubes
B40.100 ..... Pressure Gauges and Gauge Attachments

C. American Society for Testing and Materials (ASTM):

A123 ..... Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A148M ..... Standard Specifications for Steel Castings
A242 ..... Standard Specifications for High Strength Low Alloy Structural Steel AASHTO No. M161
A307 ..... Standard Specifications for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

A536 ..... Standard Specifications for Ductile Iron Castings
B61 ..... Steam or Valve Bronze Castings
B62 ..... Composition Bronze or Ounce Metal Castings
B88 ..... Seamless Copper Water Tube
B828 ..... Standard Practice: Soldering and Brazing Copper Tube and fittings
C32 ..... Sewer and Manhole Brick (Made from Clay or Shale)
C139 ..... Concrete Masonry Units for Construction of Catch Basins and Manholes
D1784 ..... Standard Specifications for Rigid PVC Compounds and CPVC Compounds
D1869 ..... Standard Specifications for Rubber Rings for Asbestos Cement Pipe
D2464 ..... Standard Specifications for Threaded PVC Pipe Fittings, Schedule 80
D2467 ..... Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
D3139 ..... Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
F477 ..... Elastomeric Seals (Gaskets) for Joining Plastic Pipe

D. American Water Works Association (AWWA):

B300 ..... Hypochlorites
B301 ..... Liquid Chlorine
C104 ..... Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
C105 ..... Polyethylene Encasement for Gray and Ductile C.I. Piping for Water and Other Liquids
C110 ..... Ductile-Iron and Gray-Iron Fittings, 80 mm (3 Inches) Through 1200 mm (48 Inches) for Water and Other Liquids
C111 ..... Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

C115 ..... Flanged Ductile-Iron and Gray-Iron Pipe with Threaded Flanges

C150 ..... American National Standard for Thickness Design of Ductile Iron Pipe

C151 ..... Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids

C153 ..... Ductile-Iron Compact Fittings, 80 mm (3 inches) Through 300 mm (12 Inches) for Water and Other Liquids

C500 ..... Gate Valves for Water and Sewerage Systems

C502 ..... Dry-Barrel Fire Hydrants

C503 ..... Wet-Barrel Fire Hydrants

C508 ..... Swing Check Valves for Waterworks Service, 2 Inches (50 mm) Through 24 Inches (600mm) NPS

C509 ..... Resilient Seated Gate Valve for Water and Sewage System

C510 ..... Double Check Valve Back-Flow Prevention Assembly

C511 ..... Reduced Pressure Principle Back-Flow Prevention Assembly

C550 ..... Protective Epoxy Interior Coatings for Valves and Hydrants

C600 ..... Installation for Ductile-Iron Water Mains and Their Appurtenances

C605 ..... Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

C651 ..... Disinfecting Water Mains

C800 ..... Underground Service Line Valves and Fittings

C900 ..... Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inches thru 12 Inches, for Water

C905 ..... Polyvinyl Chloride (PVC) Pressure Pipe, 14 Inches thru 36 Inches

E. National Fire Protection Association (NFPA):

24 ..... Installation of Private Fire Service Mains and Their Appurtenances

291 ..... Fire Flow Testing and Marking of Hydrants

1141 ..... Fire Protection in Planned Building Groups

F. NSF International:

14 ..... Plastics Piping Components and Related Materials

61 ..... Drinking Water System Components-Health Effects (Sections 1-9)

G. American Welding Society (AWS):

A5.8 ..... Brazing Filler Metal

H. Foundation for Cross-Connection Control and Hydraulic Research-2005

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS:

A. Ductile iron pipe, direct buried:

1. Provide ductile iron pipe conforming to the requirements of AWWA C151, Pressure Class 350 for Pipe 4 inches through 12 inches in diameter and 250, minimum for pipe larger than 12 inches in diameter, with standard thickness cement mortar lining interior, and interior asphaltic seal coat and exterior asphaltic coating, in accordance with AWWA and ANSI Standards.
2. Below Grade: Supply pipe in lengths not in excess of a nominal 20 feet with rubber ring type push-on joints, mechanical joint or approved restrained joint. Provide flange joint pipe where shown on the drawings. Provide mechanical and restrained joint pipe with sufficient quantities of accessories as required for each joint.
3. When a polyethylene encasement over pipe, fittings, and valves is a requirement as indicated on the drawings, the material, installation and workmanship shall conform to applicable sections of AWWA C105. Make provisions to keep the polyethylene from direct exposure to sunlight prior to installation. Backfill following installation without delay to avoid exposure to sunlight.

B. Ductile Iron Pipe Above Grade or in Below Ground Concrete Pits:

1. Flanged ductile iron pipe, AWWA C115, with factory applied screwed long hub flanges except as otherwise specified hereinafter. Face and drill flanges after being screwed on the pipe, with flanges true to 90 degrees with the pipe axis and flush with end of pipe, ANSI B16.1, 125 psi or 250 psi standard, for the purpose intended.

2. Wall Sleeve Castings: Size and types shown on the drawings and be hot dipped galvanized. Seal strips, where required shall be Link Seal as manufactured by Thunderline Corp., Wayne, Michigan or equal.
3. Pipe Thickness Class: Minimum of Class 53 as defined in AWWA C150 for all sizes of flanged pipe.
4. Rubber Ring Gaskets: Full face type, AWWA C111, 1/16 inch rubber ring gaskets and of approved composition suitable for the required service.
5. Bolts and Nuts on Flanged Fittings: Grade B, ASTM A307. Low alloy, high strength steel in accordance with AWWA C111. Assemble stainless steel bolts and nuts using anti-seize compound to prevent galling.

C. All Pipe Fittings: Ductile iron with a minimum pressure rating of 350 psi. Fittings shall meet the requirements of ANSI and AWWA specifications as applicable. Rubber gasket joints shall conform to AWWA C111 for mechanical and push-on type joints. Ball joints shall conform to AWWA C151 with a separately cast ductile iron bell conforming to ASTM A148. Flanged fittings shall conform to AWWA C115 and be furnished flat faced and drilled to 125 psi or 250 psi template in accordance with ANSI B16.1 with full faced gaskets.

D. Provide cement mortar lining and bituminous seal coat on the inside of the pipe and fittings in accordance with AWWA C104. Provide standard asphaltic coating on the exterior.

E. Provide a factory hydrostatic test of not less than 500 psi for all pipe in accordance with AWWA C151.

F. Provide non-detectable tape above all buried ductile iron pipe as indicated on plans, extended along the length of the pipe and have black lettering identifying the pipe service at no more than 12 inch intervals. According to service, the tape background color shall be as follows: force main/sanitary-green; potable water-blue.

2.2 POLYVINYL CHLORIDE PIPE AND FITTINGS:

A. Class-Rated Polyvinyl Chloride (PVC) Pipe:

1. PVC pipe and accessories 4 inches–12 inches in diameter, AWWA C900 "Polyvinyl Chloride (PVC) Pressure Pipe", Class 235, DR 18, cast iron outside diameters, unless otherwise shown or specified.

2. PVC pipe and accessories 14 inches or larger, AWWA C905, "Polyvinyl Chloride Water Transmission Pipe", Class 235, DR 18, cast iron outside diameters unless otherwise shown or specified. Pipe and accessories shall bear the NSF mark indicating pipe size, manufacturer's name, AWWA and/or ASTM Specification number, working pressure and production code. Pipe and couplings shall be made in accordance with ASTM D1784.
3. PVC Pipe and Accessories Smaller than 4 inches: Schedule 80, meeting the requirements of ASTM D-1785, Type 1, Grade 1. All exposed piping shall be CPVC meeting requirements of ASTM F441.

B. Joints:

1. Pipe 3 inches and Greater in Diameter: Push-on type with factory installed solid cross section elastomeric ring meeting the requirements of ASTM F-477.
2. Pipe Less Than 3 inches in Diameter: Threaded (ASTM D-2464) or solvent welded (ASTM 2467). Use Teflon tape or liquid Teflon thread lubricant approved for use on plastic on all threaded joints.

C. Fittings:

1. Class-Rated Pipe 3 inches in Diameter and Greater: Ductile iron with mechanical joints conforming to the requirements of AWWA C153.
2. For Schedule 80 Pipe less than 3 inches in Diameter: Threaded or solvent weld. Threaded PVC fittings shall conform to ASTM D2464. CPVC fittings shall conform to ASTM F437 for threaded fittings and ASTM F439 for solvent weld fittings.

2.3 POLYETHYLENE PRESURE PIPE AND TUBING:

A. Polyethylene (PE) Pipe:

1. PE pipe and accessories 3/4 inches–3 inches in diameter, AWWA C901 "Polyethylene Pressure Pipe and Tubing", Class 250, PE4710, SDR 9, unless otherwise shown or specified.

B. Fittings:

1. Provide fittings of the same size and pressure rating as the pipe to which they are connected.

2. Provide fittings as recommended by the pipe manufacturer to comply with the appropriate Standard listed below:
   a. PE Fused Butt Type, Schedule 40: ASTM D3261
   b. PE Fused Socket Type, SDR11: ASTM D2683
   c Insert Type for PE Pipe: ASTM D2609

3. Provide stainless steel clamps with inserts type fittings for PE pipe.

2.4 VALVES:

A. Asbestos packing is not allowed.

B. Gate:

1. 3 inches and Larger: Resilient seated, ductile iron body, bronze mounted, inclined seats, non-rising stem type turning counter-clockwise to open, 200 pound WOG. AWWA C509. The resilient seat shall be fastened to the gate with stainless steel fasteners or vulcanizing methods. The interior and exterior shall be coated with thermo-setting or fusion epoxy coating in accordance with AWWA C550.
2. Operator:
   a. Underground: Except for use with post indicators, furnish valves with 2 inch nut for socket wrench operation. Post indicator shall comply with the requirements of NFPA 24 and shall be fully compatible with the valve provided.
   b. Above Ground and in Pits: Hand wheels unless indicated otherwise.
3. Joints: Ends of valves shall accommodate, or be adapted to, pipe installed.

C. Check: Swing.

1. Smaller than 4 inches: Bronze body and bonnet, ASTM B61 or B62, 200 pound WOG.
2. 4 inches and Larger: Iron body, bronze trim, swing type, vertical or horizontal installation, flange connection, 200 pound WOG. Check valves for fire lines shall conform to AWWA C508 and shall be epoxy coated and lined per AWWA C550.

D. Corporation stops and saddles shall conform to AWWA C800.

E. Curb Stop: Smaller than 3 inches. Waterworks standard for IPS PE DR9, single piece cast bronze body with tee top operated plug sealed with O-ring gaskets, 200 pound WOG per AWWA C800.

2.5 CURB STOP BOX:

Cast iron extension box with screw or slide type adjustment and flared base. Box shall be adapted, without full extension, to depth of cover required over pipe at stop location. Cast the word "WATER" in cover and set cover flush with finished grade. Curb stop shut-off rod shall extend 2 feet above top of deepest stop box.

2.6 VALVE BOX:

Six(6) inch PVC SDR 35 box as indicated on drawings and cut to length required. Box shall be adapted, to depth of cover required over pipe at valve location. Cast the word

"WATER" in cover. Provide one(1) "T" handle socket wrenches of 5/8 inch round stock long enough to extend 2 feet above top of deepest valve box. Provide concrete pad six(6) inches thick and 2'-6" inches diameter as indicated.

2.7 POST INDICATOR VALVE:

A. Valve: Valve shall conform to the specifications listed in Section 2.4 for gate valves. The Post Indicator shall conform to NFPA 24, and shall be fully compatible with the valve and all the supervisory switches.

2.8 FIRE HYDRANTS:

A. Furnish and install fire hydrants approved by local jurisdictions Water Service Utility, or as specified with remote reading system compatible with local jurisdiction. Forward approval.

2.9 PIPE SLEEVES:

Ductile iron or zinc coated steel.

2.10 WATER METER:

Furnish and install meter approved by local jurisdictions Water Service Utility, or as specified with remote reading system compatible with local jurisdiction. Forward approval.

2.11 VAULTS (BACKFLOW PREVENTER AND/OR METER):

A. Top and base shall be reinforced concrete.

B. Walls shall be reinforced concrete, precast concrete (ASTM 478, minimum 3,000 psi), or segmental block (ASTM C139) at off street & traffic. (reference plans)

C. Furnish and install meter vaults approved by local jurisdictions Water Service Utility. Forward approval.

2.12 CAST IRON FRAME AND COVER, STEPS, ETC.:

Cast iron frame and cover, steps, etc. shall comply with local jurisdictions Water Service Utility Standards. Forward Approval. (Reference plans)

2.13 POTABLE WATER:

Water used for filling, flushing, and disinfection of water mains and appurtenances shall conform to Safe Drinking Water Act. Contractor shall pay utility for water used for testing and disinfection.

2.14 DISINFECTION CHLORINE:

A. Liquid chlorine shall conform to AWWA B301 and AWWA C651.

B. Sodium hypochlorite shall conform to AWWA B300 with 5 percent to 15 percent available chlorine.

C. Calcium hypochlorite shall conform to AWWA B300 supplied in granular form or 5.g tablets, and shall contain 65 percent chlorine by weight.

2.15 WARNING TAPE

Standard, 4-Mil polyethylene 3 inch wide tape, non-detectable type, blue with black letters, and imprinted with "CAUTION BURIED WATER LINE BELOW".

PART 3 – EXECUTION

3.1 BUILDING SERVICE LINES:

Install water service lines to point of connection within approximately 5 feet outside of buildings to which such service is to be connected or as indicted and provide temporary caps.

3.2 REGRADING:

Raise or lower existing valve and curb stop boxes and fire hydrants to finish grade in areas being graded.

3.3 PIPE LAYING, GENERAL:

A. Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Resident Engineer.

B. All pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective piping is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

C. All buried piping shall be installed to the lines and grades as shown on the drawings. All underground piping shall slope uniformly between joints where elevations are shown.

D. Contractor shall exercise extreme care when installing piping to shore up and protect from damage all existing underground water line and power lines, and all existing structures.

E. Do not lay pipe on unstable material, in wet trench, or when trench or weather conditions are unsuitable.

F. Do not lay pipe in same trench with other pipes or utilities unless shown otherwise on drawings.

G. Hold pipe securely in place while joint is being made.

H. Do not walk on pipes in trenches until covered by layers of earth well tamped in place to a depth of 12 inches over pipe.

I. Full length of each section of pipe shall rest solidly upon pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipes on wood blocking.

J. Tees, plugs, caps, bends and hydrants on pipe installed underground shall be anchored.

K. Close pipe openings with caps or plugs during installation. Tightly cover and protect equipment against dirt, water and chemical, or mechanical injury. At completion of all work, thoroughly clean exposed materials and equipment.

L. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by the manufacturer.

M. Warning tape shall be continuously placed 12 inches above buried water pipes, or as indicated.

3.4 DUCTILE IRON PIPE:

A. Installing Pipe: Lay pipe in accordance with AWWA C600 with polyethylene encasement if required in accordance with AWWA C105. Provide a firm even bearing throughout the length of the pipe by tamping selected material at the sides of the pipe up to the spring line.

B. All pipe shall be sound and clean before laying. When laying is not in progress, the open ends of the pipe shall be closed by watertight plug or other approved means.

C. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel cut ends of pipe to be used with push-on bell to conform to the manufactured spigot end. Cement lining shall be undamaged.

D. Jointing Ductile-Iron Pipe:

1. Push-on joints shall be made in strict accordance with the manufacturer's instruction. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is joined, and pushed home with approved means.
2. Mechanical Joints at Valves, Fittings: Install in strict accordance with AWWA C111. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber

gaskets with soapy water before tightening the bolts. Bolts shall be tightened to the specified torque.

3. Ball Joints: Install in strict accordance with the manufacturer's instructions. Where ball joint assemblies occur at the face of structures, the socket end shall be at the structure and ball end assembled to the socket.
4. Flanged joints shall be in accordance with AWWA C115. Flanged joints shall be fitted so that the contact faces bear uniformly on the gasket and then are made up with relatively uniform bolt stress.

3.5 PVC PIPE:

A. PVC piping shall be installed in strict accordance with the manufacturer's instructions and AWWA 605. Place selected material and thoroughly compacted to six inches above the top of the pipe and thereafter back filled as specified in Section 31 20 00, EARTH MOVING.

B. Copper Tracer Wire: Copper tracer wire consisting of No. 14 AWG solid, single conductor, insulated copper wire shall be installed in the trench with all piping to permit location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulation from the wire and soldering with rosin core solder. Solder joints shall be wrapped with rubber tape and electrical tape.

3.6 PE PIPE:

PE piping shall be installed in accordance with the manufacturer's instructions and as indicated on plans. Place selected material and thoroughly compacted to six inches above the top of the pipe and thereafter back filled as specified in Section 31 20 00, EARTH MOVING.

B. Copper Tracer Wire: Copper tracer wire consisting of No. 14 AWG solid, single conductor, insulated copper wire shall be installed in the trench with all piping to permit location of the pipe with electronic detectors. The wire shall not be spiraled around the pipe nor taped to the pipe. Wire connections are to be made by stripping the insulation from the wire and soldering with rosin core solder. Solder joints shall be wrapped with rubber tape and electrical tape.

3.7 PIPE SUPPORTS:

A. Supports:

1. All piping shall be properly and adequately supported. Hangers, supports, base elbows and tees, and concrete piers and pads shall be provided as indicated on the drawings. If the method of support is not indicated on the drawings, exposed piping shall be supported by hangers wherever the structure is suitable and adequate to carry the superimposed load. Supports shall be placed approximately 8 feet on centers and at each fitting.
2. Hangers shall be heavy malleable iron of the adjustable swivel type, split ring type, or the adjustable-swivel, pipe-roll type for horizontal piping and adjustable, wrought iron, clamp type for vertical piping. Flat steel strap or chain hangers are not acceptable unless indicated on the drawings.
3. Hangers shall be attached to the structure, where possible, by beam clamps and approved concrete inserts set in the forms before concrete is poured. Where this method is impractical, anchor bolts with expanding lead shields, rawl drives, or malleable iron expansion shields will be permitted.
4. Where hangers cannot be used, the Contractor shall provide pipe saddle supports with pipe column and floor flange.

3.8 RESTRAINED JOINTS:

A. Sections of piping requiring restrained joints shall be constructed using pipe and fittings with restrained "locked-type" joints and the joints shall be capable of holding against withdrawal for line pressures 50 percent above the normal working pressure but not less than 200 psi. The pipe and fittings shall be restrained push-on joints or restrained mechanical joints.

B. The minimum number of restrained joints required for resisting force at fittings and changes in direction of pipe shall be determined from the length of retained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. Restrained pipe length shall be as shown on the drawings.

C. Restrained joint assemblies with ductile iron mechanical joint pipe shall be "Flex-Ring", "Lok-Ring", or mechanical joint coupled as manufactured by American Cast Iron Pipe Company, "Mega-Lug" or approved equal.

D. Ductile iron pipe bell and spigot joints shall be restrained with EBBA Iron Sales, Inc. Series 800 Coverall or approved equal.

E. Ductile iron mechanical joint fittings shall be restrained with EBBA Iron Sales, Inc. Series 1200 Restrainer. The restraining device shall be designed to fit standard mechanical joint bells with standard T head bolts conforming to AWWA C111 and AWWA C153. Glands shall be manufactured of ductile iron conforming to ASTM A536. Set screws shall be hardened ductile iron and require the same torque in all sizes. Steel set screws not permitted. These devices shall have the stated pressure rating with a minimum safety factor of 2:1. Glands shall be listed with Underwriters Laboratories and/or approved by Factory Mutual.

F. Thrust blocks shall not be permitted.

G. Where ductile iron pipe manufactured with restrained joints is utilized, all restrained joints shall be fully extended and engaged prior to back filling the trench and pressurizing the pipe.

H. PVC pipe bell and spigot joints shall be restrained with the Uni-Flange Corp. Series 1350 Restrainer or approved equal. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A536. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy steel meeting the requirements of ASTM A242.

I. Ductile iron mechanical joint fittings used with PVC pipe shall be restrained with UNI-Flange Corp. Series 1300 Restrainer, EBBA Iron, Inc, Series 2000PV Mechanical Joint Restrainer Gland, or approved equal. The restraining device and Tee head bolts shall be manufactured of high strength ductile iron meeting ASTM A-536. Clamping bolts and nuts shall be manufactured of corrosion resistant high strength, low alloy steel meeting the requirements of ASTM A242.

3.9 PIPE SEPARATION:

A. Horizontal Separation-Water Mains and Sewers:

1. Water mains shall be located at least 10 feet horizontally from any proposed drain, storm sewer, sanitary or sewer service connection.

2. Water mains shall maintain at least 5 feet horizontally from other utilities.

3. Water mains may be located closer than 10 feet to a sewer line when:

   a. Local conditions prevent a lateral separation of 10 feet; and

   b. The water main invert is at least 24 inches above the crown of the sewer; and

4. When it is impossible to meet (1) or (2) above, both the water main and drain or sewer shall be constructed of mechanical joint ductile iron pipe. Ductile iron pipe shall comply with the requirements listed in this specification section. The drain or sewer shall be pressure tested to the maximum expected surcharge head before back filling.

B. Vertical Separation-Water Mains and Sewers:

1. A water main shall be separated from a sewer so that its invert is a minimum 24 inches above the crown of the drain or sewer whenever water mains cross storm sewers, sanitary sewers or sewer service connections. The vertical separation shall be maintained for that portion of the water main located within 10 feet horizontally of any sewer or drain crossed. A length of water main pipe shall be centered over the sewer to be crossed with joints equidistant from the sewer or drain.
2. Both the water main and sewer shall be constructed of slip-on or mechanical joint ductile iron pipe or PVC pipe equivalent to water main standards of construction when:
   a. It is impossible to obtain the proper vertical separations described in (1) above; or
   b. The water main passes under a sewer or drain.
3. A vertical separation of 24 inches between the invert of the sewer or drain and the crown of the water main shall be maintained where a water main crosses under a sewer. Support the sewer or drain lines to prevent settling and breaking the water main.
4. Construction shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer or drain line is at least 3 m (10 feet).

3.10 SETTING OF VALVES AND BOXES:

A. Provide a surface concrete pad 18 by 18 by 6 inches to protect valve box when valve is not located below pavement.
B. Clean valve and curb stops interior before installation.
C. Set valve and curb stop box cover flush with finished grade.
D. Valves shall be installed plumb and level and in accordance with manufacturer's recommendations.

3.11 SETTING OF FIRE HYDRANTS:

A. Set center of each hydrant not less than 3 feet nor more than 6 feet back of edge of road or face of curb. Fire apparatus connection shall face road with center of nozzle 18 inches above finished grade. Set barrel flange not more than 2 inches above finished grade.

B. Set each hydrant on a slab of stone or concrete not less than 6 inches thick and 15 inches square. The service line to the hydrant, between the tee and the shoe of the hydrant, shall be fully restrained.

C. Set bases in not less than 1/2 cubic yard of crushed rock or gravel placed entirely below hydrant drainage device.

D. Clean interiors of hydrants of all foreign matter before installation.

3.12 PIPE SLEEVES:

Install where water lines pass through retaining walls, building foundations and floors. Seal with modular mechanical type link seal. Install piping so that no joint occurs within a sleeve. Split sleeves may be installed where existing lines pass through new construction.

3.13 FLUSHING AND DISINFECTING:

A. Flush and disinfect new water lines in accordance with AWWA C651.

1. Public Water Mains: Additionally meet OAC 252:626-19-2(f)

B. Initial flushing shall obtain a minimum velocity in the main of 0.75 m/sec (2.5 feet per second) at 40 PSI residual pressure in water main. The duration of the flushing shall be adequate to remove all particles from the line.

Pipe Diameter	Flow Required to Produce 2.5 ft/sec(approx.) Velocity in Main	Number of Hydrant Outlets			
		Size of Tap. in.			
		1	1-1/2	2	2-1/2
In	gpm	Number of taps on pipe			
4	100	1	--	--	1
6	200	--	1	--	1
8	400	--	2	1	1
10	600	--	3	2	1
12	900	--	--	3	2
16	1,600	--	--	4	2

The backflow preventers shall not be in place during the flushing.

C. The Contractor shall be responsible to provide the water source for filling, flushing, and disinfecting the lines. Only potable water shall be used, and the Contractor shall provide

all required temporary pumps, storage facilities required to complete the specified flushing, and disinfection operations.

D. The Contractor shall be responsible for the disposal of all water used to flush and disinfect the system in accordance with all governing rules and regulations. The discharge water shall not be allowed to create a nuisance for activities occurring on or adjacent to the site.

E. The bacteriological test specified in AWWA C651 shall be performed by a laboratory approved by the Department of Environmental Quality of the State. The cost of sampling, transportation, and testing shall be the responsibility of the Contractor.

F. Re-disinfection and bacteriological testing of failed sections of the system shall be the sole responsibility of the Contractor.

G. Before backflow preventers are installed, all upstream piping shall be thoroughly flushed.

3.14 HYDROSTATIC TESTING:

A. Hydrostatic testing of the system shall occur prior to disinfecting the system.

B. After new system is installed, except for connections to existing system and building, backfill at least 12 inches above pipe barrel, leaving joints exposed. The depth of the backfill shall be adequate to prevent the horizontal and vertical movement of the pipe during testing.

C. Prior to pressurizing the line, all joint restraints shall be completely installed and inspected.

D. If the system is tested in sections, and at the temporary caps at connections to the existing system and buildings, the Contractor shall provide and install all required temporary thrust restraints required to safely conduct the test.

E. The Contractor shall install corporation stops in the line as required to purge the air out of the system. At the completion of the test, all corporation stops shall be capped.

F. The Contractor shall perform pressure and leakage tests for the new system for 2 hours to 150 psi. Leakage shall not exceed the following requirements.

1. PE Tubing: No leaks.
2. Ductile Iron Pipe: AWWA C600. Not to exceed 10 gallons/inch diameter/mile/day
3. Polyvinyl Chloride (PVC) AWWA C605.
4. Public Water Mains: Additionally meet OAC 252:626-19-2(e)

3.15 BACKFLOW PREVENTOR TESTING:

A. All backflow preventers shall be tested and certified for proper operation prior to being placed in operation.

B. Original copies of the certification shall be submitted to the Engineer.

END OF SECTION 33 10 00

BURGESS ENGINEERING AND TESTING

July 17, 2023

Hennessey Public Schools
605 East Oklahoma
Hennessey, OK 73742

Attention: Jason Sternberger
Superintendent

Re: Report of Subsurface Exploration, Foundation
And Pavement Recommendations for
Campus Improvements; Bus Barn Renovation and Site Improvements
Near S.H. 51 and N. Mitchell Road
Hennessey, Oklahoma
UPDATED Project No.: 731-23084

Dear Mr. Sternberger:

Burgess Engineering and Testing (BET) is pleased to submit this report of subsurface exploration for the above referenced project. Contained in this presentation are the results of the exploration and recommendations concerning the design and construction of the foundations, pavement and general site development.

We appreciate the opportunity to have provided you with our geotechnical engineering services, and look forward to working with you during the construction phase of this project. If you have any questions concerning this report or if we may be of further service in any manner please contact our office.

Respectfully,
Burgess Engineering And Testing

Basil Abdulkareem, P.E.
Geotechnical Engineer

Ali H. Ebrahimi, Ph.D. P.E.
Manager

LICENSED PROFESSIONAL ENGINEER
ALI HONARNMAND-EBRAHIMI
16029
OKLAHOMA

BA/jg

UPDATED REPORT OF SUBSURFACE EXPLORATION, FOUNDATION AND PAVEMENT RECOMMENDATIONS

CAMPUS IMPROVEMENTS; BUS BARN RENOVATION AND SITE IMPROVEMENTS NEAR S.H. 51 AND N. MITCHELL ROAD HENNESSEY, OKLAHOMA PROJECT NO.: 731-23084

PREPARED FOR

HENNESSEY PUBLIC SCHOOLS
605 EAST OKLAHOMA
HENNESSEY, OK 73742

JULY 17, 2023

BY

BURGESS ENGINEERING AND TESTING
809 NW 34TH STREET
MOORE, OKLAHOMA 73160

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APPENDIX

1.0 INTRODUCTION AND RECOMMENDATION SUMMARY

1.1 Project Authorization

Burgess Engineering And Testing has completed a subsurface exploration and evaluation of foundation and pavement conditions for the Campus Improvements; Bus Barn Renovation and Site Improvements, near S.H. 51 and N. Mitchell Road, in Hennessey, Oklahoma. The work was authorized by Mr. Jason Sternberger, Superintendent of Hennessey Public Schools, and was performed in accordance with the BET proposal number 23165.

The purpose of this study was to explore the subsurface conditions at the site to facilitate the evaluation of possible foundation and pavement systems for building and new pavement system. This report briefly outlines the testing procedures, describes the site and subsurface conditions, and discusses the foundation and pavement recommendations.

The scope of services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, ground water, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of the client.

1.2 Recommendation Summary

As requested by Mr. Steve Burgess, RA, AIA, Sr. Project Architect at Renaissance Architecture, four (4) test borings were drilled in the area of the proposed project, at the locations provided by Renaissance Architecture. Borings' locations, numbers and their respective depths are presented in the following table:

Bore Numbers	G.P.S.	Depth (ft)
B-1	36.115846°, -97.887504°	20
B-2	36.115847°, -97.887720°	20
B-3	36.116044°, -97.887504°	20
B-4	36.116043°, -97.887720°	20

Results from the test borings indicate the presence of low to medium plasticity lean clay with sand at the site. No Bedrock was encountered at the extent of the test borings. Water level observations were made during the field operations and are noted on the Log of Borings. The depths of water table observations of the test borings are presented in the following table:

Bore No.	Water Table Depth (ft)
B-1	15
B-2	15*
B-3	15
B-4	15*

Remarks ***Possible water table due to high moisture**

A detailed report of subsurface conditions is presented in the attached Appendix "A" on the log of boring. Conditions that might affect the construction of the proposed facilities include:

1. In order to minimize the differential settlement, the footings are recommended to be supported on similar material.
2. Special attention must be given in designing of the foundation for these additions adjacent to the existing facilities. It is advisable to place the foundations for the additions at the same level as the foundations of the existing buildings so that stresses applied by the new footings will not be transferred to the existing foundations. Construction joints should be provided between the existing building and the addition.

The recommended foundation systems for the proposed project are spread footings for building's columns and continuous footings for walls with conventional floor slabs. The recommended bearing capacities for the foundation systems are presented in the following table:

Foundation Type	Bearing Capacity Recommendation	Estimated Settlement
Spread Footings Supported on Properly Prepared Existing Soil	2,000 psf	1 inch
Continuous Footings Supported on Properly Prepared Existing Soil	1,400 psf	1 inch

Detailed analyses of subsurface conditions, and pertinent design recommendations for the construction of foundations are included herein. The final decision regarding which foundation type will be used should be based on the design parameters given, cost, risk of foundation movement, and other factors beyond the scope of this study.

Burgess Engineering and Testing cannot be responsible for the interpretation or implementation of this report by others. Burgess Engineering and Testing should be retained to perform services sufficient to determine compliance with its recommendations. If Burgess Engineering and Testing is not so retained, it will not accept any responsibility for the difficulties encountered during the construction or performance of

the structure.

2.0 TESTING PROCEDURES

2.1 Field Operations

As requested by Mr. Steve Burgess, RA, AIA, Sr. Project Architect at Renaissance Architecture, four (4) test borings were drilled in the area of the proposed project, at the locations provided by Renaissance Architecture. Borings' locations, numbers and their respective depths are presented in the following table:

Bore Numbers	G.P.S.	Depth (ft)
B-1	36.115846°, -97.887504°	20
B-2	36.115847°, -97.887720°	20
B-3	36.116044°, -97.887504°	20
B-4	36.116043°, -97.887720°	20

Borings' locations are presented on the attached Boring Location Diagram presented in Appendix "A." The test borings were located and drilled in field by BET personnel by measuring distances from known reference points. The elevations of the test borings will be determined by others during the design phase of the project.

The borings were advanced into the ground using hollow stem augers. At regular intervals throughout the boring depths, soil samples were obtained with a 1.4 inch I.D., and 2.0 inch O.D., split spoon sampler. When using the split spoon sampler, the sampler was first seated six (6) inches to penetrate any loose cuttings and then driven an additional foot with blows from a 140-pound hammer falling (30) inches. The number of hammer blows required to drive the sampler each six (6) inch increments are recorded in the field.

The penetration resistance, "N-value," is designated as the number of hammer blows required to drive the sampler the final one (1) foot. When properly evaluated, it is an indication of relative density for sands and to a lesser degree an index to cohesion for clays. The split spoon sampling procedures used during this exploration are in basic accordance with ASTM Designation D 1586. Split spoon samples are suitable for visual examination and classification tests, but generally are not sufficiently intact for quantitative laboratory testing.

Records of subsurface exploration (Logs of Boring) containing soil descriptions, stratifications, penetration resistance, locations of the split spoon, and ground water levels are presented in Appendix "A." The stratifications shown on the boring logs represent the soil conditions at the actual boring locations.

Variations may occur between borings. Lines of demarcation represent the approximate boundary between the soil types; however, the transition may be gradual.

2.2 Laboratory Testing

The soil samples obtained during the field exploration were transported to the laboratory and examined by a soil engineer. By visual inspection soil samples were approximately classified using the Unified Soil Classifications System (USCS).

Laboratory tests were performed on representative samples of the subsurface soils in substantial accordance with the applicable ASTM Designations or with other commonly accepted laboratory practice. The laboratory testing schedule included determination of the soils' natural moisture contents (ASTM D2216), Atterberg limits values (ASTM D4318), and grain size distributions (ASTM D421 and ASTM D422). These test results are presented in Appendix "B."

Samples not altered by laboratory testing will be retained at our office for sixty (60) days from the date of this report and then discarded unless we are otherwise instructed.

3.0 SITE AND SUBSURFACE CONDITION

3.1 Site Description and Subsurface Conditions

The proposed project is located approximately 700 feet east and 200 feet south of the intersection of S.H. 51 and N. Mitchell Road, in Hennessey, Oklahoma. The surrounding area is developed with a metal building at the east side and undeveloped on the other sides. At the time of field exploration, the surficial soils were firm and the truck-mounted drilling rig encountered no difficulty moving about the site.

The subsurface conditions encountered at each boring location are indicated on the Log of Boring in Appendix "A." The stratification boundaries shown on the Log of Boring represent the approximate location of changes in geological material. The transition between material types may be gradual. For detailed information regarding test results at specific depths refer to Log of Boring and Summary of Laboratory Test Results in Appendices "A" and "B," respectively.

3.2 Ground Water Conditions

Water level observations were made during the field operations and are noted on the Log of Borings. The depths of water table observations of the test borings are presented in the following table:

Bore No.	Water Table Depth (ft)
B-1	15
B-2	15*
B-3	15
B-4	15*

Remarks ***Possible water table due to high moisture**

In relatively impervious soils, the accurate determination of the groundwater elevation may not be possible even after several days of observation. However, in relatively pervious soils, such as sandy soils, the indicated elevations are considered reliable groundwater levels. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table and volumes of water will depend on the permeability of the soils.

4.0 STRUCTURAL INFORMATION

Limited structural information is available to us at this time. Based on the information provided by Mr. Steve Burgess, RA, AIA, Sr. Project Architect at Renaissance Architecture, the proposed project will be Campus Improvements; Bus Barn Renovation and Site Improvements, Near S.H. 51 and N. Mitchell Road, in Hennessey, Oklahoma. The new project consists of constructing 6,880 S.F., one story addition metal building to the existing 6,900 S.F. metal building. The existing metal building and new metal building will function as a Transportation Facility (Bus Barn). Relatively light structural loading is anticipated for this project.

Since a detailed grading plan has not been furnished, the amount of cuts and fills in the building areas is assumed to be limited to two (2) feet, to achieve the final grades. If the initial design parameters should change or be in error, it should be brought to our attention so that we may review the applicability of the recommendations made in this report.

5.0 FOUNDATION RECOMMENDATIONS

5.1 Discussion

The bearing capacities of the existing soils were evaluated based on the results of Standard Penetration Tests (SPT), Atterberg limit tests, and Unified Soil Classifications System (USCS). These test results suggest that the existing soils have low bearing capacity with respect to shear strength, and low to medium expansion and shrinkage potential. In order to minimize the differential settlement, the footings are

recommended to be supported on similar material. Special attention must be given in designing of the foundation for these additions adjacent to the existing facilities. It is advisable to place the foundations for the additions at the same level as the foundations of the existing buildings so that stresses applied by the new footings will not be transferred to the existing foundations. Construction joints should be provided between the existing building and the addition.

The geologic materials at the site can be classified as **Terrace Deposits (Qts)** overlaying **Hennessey Unit (Phy)** based on the Engineering Classification of Geological Materials for Kingfisher County, Division Four. Terrace Deposits (Qts) "consist of sand, silt, clay, gravel, and/or mixtures of these. Terrace materials occur adjacent to or near streams at higher elevations than the flood plain (bottom land). Like alluvium, these deposits are not all shown on the geologic unit maps." Hennessey Unit (Phy) "This unit consists of red platy to blocky clay shales and mudstone. The mudstones are hard and appear blocky. The red clay shale of the Hennessey Unit is characterized by numerous bands of streaks of white or light green color ranging from a few inches to four feet in thickness. Small spheres of light green color up to 10 inches in diameter are on odd characteristic of the unit." A detail geological statement of the **Terrace Deposits (Qts)** and **Hennessey Unit (Phy)** is presented in Appendix "B."

The recommended foundation systems for the proposed project are spread footings for building's columns and continuous footings for walls with conventional floor slabs. The final selection of foundation type and depth should be based on the following criteria:

(1) The soils' properties including the strength properties, the expansive characteristics, and the settlement potential of subsurface materials; (2) the magnitude of structural loads; and (3) the design and economics. In the following sections each recommended foundation system is addressed with respect to the above criteria.

5.2 Conventional Spread and Continuous Wall Footings

The subsurface conditions encountered in the borings for the proposed project are adequate for shallow foundation. Spread footings for building columns and continuous footings for walls supported on properly prepared existing soil should be designed for maximum net allowable soil bearing pressures of 2,000 psf and 1,400 psf, respectively, based on dead loads plus design lives loads.

The settlement is expected to be limited to less than one (1) inch. The maximum differential settlement should be less than 0.5 inches. Minimum foundation widths for column footings should be twenty-four (24) inches and eighteen (18) inches for strip footings, despite any reduction in bearing pressure. The bottom of all footings and grade walls should be placed at least twenty-four (24) inches below the lowest adjacent final outside grades to resist frost penetration. To reduce any differential settlement, it is imperative

to ensure that all the shallow foundations are constructed on similar materials.

The properties in the following table may be used to determine the sliding coefficient and lateral pressure at the footings and concrete interface.

Soil Parameters	Existing Soil
Wet Unit Weight (pcf)	110
Internal Friction Angle (φ)	17°
K_0	0.70
K_a	0.54
K_p	1.82
Interface Materials Friction Factor	0.30

where K_o= Coefficient of at-rest earth pressure
K_a= Coefficient of active earth pressure
K_p= Coefficient of passive earth pressure
A safety factor of one and one half (1.5) should be used against foundation sliding.

Unsuitable bearing material when encountered in the foundation excavation should be removed and replaced with concrete (compressive strength of at least 1,000 psi). Extreme care should be taken to prevent the weakening of the foundation bearing materials due to prolonged atmospheric exposure, construction activity disturbance, or an increase in moisture content. To reduce the effect of differential movement that may occur due to variations in properties of supporting soils or in seasonal moisture contents, it is recommended that all continuous footings be suitably reinforced.

5.3 Conventional Floor Slab

A floor slab supported on properly prepared existing soil may be used for the proposed facility. Proof-rolling and visual inspection, as discussed later in this report, may be required to aid in identifying any soils that should be removed from the slab areas before slab construction.

The floor slab should be constructed on a compacted six-inch thick aggregate base placed on top of the existing soils. These aggregate base materials should be gravel, free of sharp corners or edges, natural stone, washed, free of clay, shale, organic matter, and with 1/4 inch minimum size, and 5/8 inch maximum size. Burgess Engineering and Testing recommends the placement of a vapor barrier of polyethylene sheeting. The location of the vapor barrier should be determined in accordance with the flow chart presented in ACI committee report 302.1R-15 or other current ACI reports. Adequate reinforcement and construction joints should be provided to limit cracking of the floor slab resulting from any differential movement or shrinkage. Where practical, the floor slab should not be rigidly connected to columns, walls, or foundations.

Furthermore, consideration should be given to providing movement flexibility in the utility system of the structure. Proof-rolling and visual inspection, as discussed later in this report, may be required to aid in identifying any soils that should be removed from the slab areas before fill placement and/or floor slab construction.

5.4 Seismic Information

Based on the International Building Code (IBC 2018), the site is classified as Site Class C. There is no slope instability, liquefaction, or surface displacements associated with faulting or seismically induced lateral flow. According to USGS for ground shaking intensity, the Modified mercalli Intensity for the area in question is within zone V or greater. The area is not subject to the New Madrid Fault Line.

6.0 PAVEMENT RECOMMENDATIONS

6.1 Design Considerations for Asphaltic Concrete and Portland Cement Pavement

A satisfactory pavement can be constructed on a properly prepared base. We have used the results of the test borings for the pavement design. Based on these tests, the type of pavement for the new paving is presented for the site:

1- Light Duty Asphaltic Concrete or Portland Cement Pavement (LD) for parking lots

2- Heavy Duty Asphaltic Concrete or Portland Cement Pavement (HD) for the approach to the site and dumpster pads.

3- Gravel Pavement.

Assumed Average Daily Traffic (ADT) for light and heavy duties are presented in the following table:

Axle Type	Number of Vehicles	
	Light Duty	Heavy Duty
Passenger Car	200	200
Delivery, Buses, 1 Axle	4	30
Delivery, Trash Trucks, 2 Axle	2	3
Delivery Trucks, 3 Axle	1	2

Should the assumed average daily traffic value be in error, please contact this office so that the pavement design recommendations can be re-evaluated.

The pavement section thicknesses reported herein are based on CBR value of 3.0. This CBR value should be confirmed by performing a field CBR or DCP test after the construction of the fill. We have

assumed that any soft or loose surficial soils will be undercut to the level of firm to stiff soils and backfilled with adequately compacted structural fills. Additionally, the pavement recommendations are based on the following parameters:

Light Duty Pavement (LD)

Pavement Type	Design Life (Years)	Terminal Serviceability	Reliability	ESAL
Asphaltic Concrete Pavements	20	2.5	80%	134,259
Portland Cement Pavements	20	2.5	80%	144,657

Heavy Duty Pavement (HD)

Pavement Type	Design Life (Years)	Terminal Serviceability	Reliability	ESAL
Asphaltic Concrete Pavements	20	2.5	80%	714,972
Portland Cement Pavements	20	2.5	80%	792,056

Should the assumed average daily traffic value be in error, please contact this office so that the pavement design recommendations can be re-evaluated.

6.2 Asphalt Pavement Recommendations

Based on the laboratory and field data, the recommended pavement sections are presented in the following tables:

Light Duty Asphaltic Concrete Pavement (LD Asphalt)

ASPHALTIC CONCRETE PAVEMENT	
TYPE	THICKNESS (IN)
Asphaltic Concrete Pavement	2" Type "S4" Surface Course
	3" Type "S3" Base Course
Stabilized Subgrade or Aggregate Base (ODOT Non-recycled Aggregate Base Type "A")	6"

Heavy Duty Asphaltic Concrete Pavement (HD Asphalt)

ASPHALTIC CONCRETE PAVEMENT	
TYPE	THICKNESS (IN)
Asphaltic Concrete Pavement	2" Type "S4" Surface Course
	5" Type "S3" Base Course
Stabilized Subgrade or Aggregate Base (ODOT Non-recycled Aggregate Base Type "A")	6"

The pavement should be placed on six (6) inches of adequately compacted hydrated lime stabilized subgrade. Five (5) percent Portland Cement by weight may be used to stabilize the soil. However, the exact amount of the Portland Cement should be determined after the final grades have been established. Since the pavement serves as a parking lot mostly, proper asphalt cement type should be selected to reduce the damage of the load to the pavement. As an alternative to the Portland Cement stabilized base, an adequately compacted six (6) inches of ODOT non-recycled aggregate base type "A" layer may be used underneath the pavement at the site. The grade shall be as smooth as practical and free of debris.

BET did not perform the mix design and is unaware of the nature of the chemical reaction between the soils and the stabilizing agents. After the stabilizing agent is selected, mix design and necessary tests should be performed to ensure that the soils and stabilizing agents are compatible. The tests should include a soil stabilization mix design (OHD L-50) and soluble sulfate tests (OHD L-49) as listed by Material & Testing Guide of the Oklahoma Department of Transportation (ODOT), to ensure the compatibility between the soil and the stabilizing agent. Additionally, further testings should be performed in field to ensure the compatibility of the soils and the stabilizing agent. The asphaltic concrete materials and construction methods should conform to ODOT Standard Specifications 2009.

6.3 Portland Cement Concrete Pavements

As an alternative to asphalt pavements, concrete may be used for this project. Based on the laboratory and field data, the recommended pavement sections are presented in the following tables:

Light Duty Portland Cement Pavement (LD Concrete)

PORTLAND CEMENT CONCRETE PAVEMENT	
TYPE	**THICKNESS**
Portland Cement Concrete Pavement	5"
Stabilized subgrade or Aggregate Base (ODOT non-recycled Aggregate Base Type "A")	6"

Heavy Duty Portland Cement Pavement (HD Concrete)

PORTLAND CEMENT CONCRETE PAVEMENT	
TYPE	**THICKNESS**
Portland Cement Concrete Pavement	7"
Stabilized subgrade or Aggregate Base (ODOT non-recycled Aggregate Base Type "A")	6"

This design requires the subgrade soils to be adequately compacted and any loose or soft area to be removed and backfilled. The pavement section should be placed on six (6) inches of adequately compacted hydrated lime stabilized subgrade. Five (5) percent Portland Cement by weight may be used to stabilize the soil. However, the exact amount of the Portland Cement should be determined after the final grades have been developed. As an alternative to the Portland Cement stabilized base, adequately compacted six (6) inches of ODOT non-recycled aggregate base type "A" layer may be used underneath the pavement at the site. The grade shall be as smooth as practical and free of debris.

BET did not perform the mix design and is unaware of the nature of the chemical reaction between the soils and the stabilizing agents. After the stabilizing agent is selected, mix design and necessary tests should be performed to ensure that the soils and stabilizing agents are compatible. The mix design should also include soluble sulfate testings (OHD L-49) to ensure the compatibility between the soil and the stabilizing agent. Additionally, further testings should be performed in the field to ensure the compatibility of the soils and the stabilizing agent.

We recommend that the pavements should have sufficient joints to control cracking. The joints should be properly sealed and maintained to prevent entry of moisture. Concrete joint patterns, slab reinforcements, and surface drainage should be designed by a structural engineer. If concrete is placed during cold weather, it should be protected from freezing during the first seven (7) days after placement. It should be noted that Continuously Reinforced Concrete Pavement (CRCP) should be considered for pavement sections ranging from seven (7) to thirteen (13) inches thick.

The concrete mix should be designed by a qualified engineer following the Portland Cement Association (PCA) and American Concrete Institute (ACI) recommendations for pavements. It is important that the concrete have a low water to cement ratio and that the concrete is placed at a relatively low slump. The pavement thickness recommendations assume that the concrete will have a minimum modules of rupture of 600 psi and a 28-day compressive strength of at least 4,000 psi. Air entrainment of five (5) percent plus or minus one (1) percent should be used for the concrete pavement.

The subgrade should be as uniform as possible and shaped so that the finished pavement will be the required thickness throughout.

6.4 Gravel Pavement Recommendations

A new gravel parking lots may be constructed at the site. The gravel pavement section thicknesses reported herein are based on an estimated daily traffic of five (5) buses per day. Low subgrade support conditions are assumed for the parking lot. Should these assumed design parameters be in error, they should be brought to our attention so that we may review the applicability of the recommendations made in this design. Based on the subsurface exploration and laboratory tests results, BET recommends the use of at least six and one half (6.5) inches of ODOT non-recycled aggregate base type "A" over properly compacted subgrade.

After stripping, excavating, and proof-rolling but before placing the fabric separator, the exposed soils should be scarified and then processed at an optimum moisture content within the range of three (3) percentage points above as determined by the Standard Proctor test. The subgrade soils should be recompacted to a dry density of at least ninety-five (95) percent of the Standard Proctor maximum dry density for a depth of at least eight (8) inches below the surface. The grade upon which the fabric separator is to be placed shall be brought to the line, grade and cross section specified. The grade shall be as smooth as practical and free of debris.

The gravel pavement should be maintained regularly to ensure proper performance. Burgess Engineering and Testing should be retained to perform services sufficient to determine compliance with its recommendations.

7.0 CONSTRUCTION CONSIDERATIONS

7.1 Site Preparation and Fill Requirements

For footings construction, we recommend that all topsoil, vegetation, roots, pavement and any soft soils in the addition area be stripped from the site and either wasted or stockpiled for later use in landscaping. Utilities should be located and rerouted as necessary.

After stripping, undercutting and before fill placement, the buildings' areas should be proof-rolled with a moderately heavy loaded pneumatic-tired vehicle such as a twenty (20) to twenty-five (25) ton dump truck or scraper. Soils that are observed to rut or deflect excessively under the moving loads should be undercut and replaced with properly compacted fills. All proof-rolling and undercutting activities should be witnessed by the Burgess Engineering and Testing and should be performed during a period of dry weather.

After stripping, excavating, and proof-rolling but before placing the fill, the exposed soils should be scarified and then processed at an optimum moisture content within three (3) percentage points above as determined by the Standard Proctor test. The subgrade soils should be recompacted to a dry density of at least ninety-five (95) percent of the Standard Proctor maximum dry density for a depth of at least six (6) inches below the surface.

After subgrade preparation and inspection have been completed, fill placement may begin. Structural fill materials used should be free of organic or other deleterious matters, have a maximum particle size of three (3) inches, and have a liquid limit less than thirty-five (35) and a plasticity index between five (5) and fifteen (15) and consist of sandy clays or clayey sands. Relatively clean sands are not recommended for use as structural fill in the building areas. Fine grained (silt or clay) soil used for the fill will require very close moisture content control to achieve the recommended degree of compaction. The fill should be placed in maximum lifts of nine (9) inches of loose material and should be compacted within the range of three (3) percentage points above the optimum moisture content value as determined by the Standard Proctor test. Added water should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Fine-grained structural fills should be compacted to at least ninety-eight (98) percent of the soils Standard Proctor maximum dry density as determined by ASTM Designation D698 in the building areas. For all other areas, fine-grained structural fills should be compacted to at least ninety-five (95) percent of the soils Standard Proctor maximum dry density as determined by ASTM Designation D698.

Each lift of compacted soil should be tested and approved by the Burgess Engineering and Testing prior to placement of subsequent lifts. As a guideline, it is recommended that field density tests be taken at a frequency of not less than one test per 1,000 or 5,000 square feet of surface area per lift of the fill in the building or pavement areas, respectively.

7.2 Stabilization Agent

A proper mix design should be determined prior to any soil stabilization. The mix design should also include testing the soil samples for soluble sulfates according to OHD L-49 to ensure the compatibility between the soil and the stabilizing agent.

7.3 Excavations

After excavating, footings should be inspected and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. If it is required that footing excavations be left open for more than one (1) day, they should be protected to reduce evaporation or entry of soil moisture. Adequate protection against sloughing of soil should be provided for workers and inspectors entering the footing excavations and undercut areas. This protection should meet the requirements of OSHA and applicable

building codes.

7.4 Drainage

Water should not be allowed to collect near the foundations or floor slab areas of the buildings either during or after construction. Undercut or excavated areas should be sloping toward one corner to facilitate removal of any collected ground water or surface run-off. Proper drainage should be provided by sloping the ground surface away from the structures. Splash blocks may be helpful in directing water away from the foundations.

7.5 Weather Considerations

The upper fine-grained soils encountered at this site are expected to be relatively sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather. Earthwork activities performed during wetter months will be more problematic than if performed during warmer, drier climatic periods.

8.0 GENERAL COMMENTS

The exploration and analysis of the foundations conditions reported herein are considered in sufficient detail and scope to form a reasonable basis for the foundation design. The recommendations submitted are based on the information provided by Mr. Steve Burgess, RA, AIA, Sr. Project Architect at Renaissance Architecture, for the proposed project. Burgess Engineering and Testing should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Burgess Engineering and Testing should also be retained to provide testing and observation during excavation, grading, foundation and construction phases of the project. Any revision of the plans for the proposed facility from those enumerated in this report should be brought to the attention of our geotechnical engineer in writing so that he may determine if changes in the foundation recommendations are required. If deviations from the noted subsurface conditions are encountered during construction, they should also be brought to the attention of the geotechnical engineer.

Burgess Engineering and Testing cannot be responsible for the interpretation or implementation of this report by others. Burgess Engineering and Testing should be retained to perform services sufficient to determine compliance with its recommendations. If Burgess Engineering and Testing is not so retained, it

will not accept any responsibility. The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made after being prepared according to the generally accepted professional engineering practice in the fields of foundation and pavement engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed. After the plans and specifications are complete, it is recommended that the geotechnical engineer be provided the opportunity to review the final design and specifications so that earthwork and foundation recommendations may be properly interpreted and implemented. At this time, it may be necessary to submit supplementary recommendations.

This report has been prepared for the exclusive use of Hennessey Public Schools, for the specific application to the Campus Improvements; Bus Barn Renovation and Site Improvements, near S.H. 51 and N. Mitchell Road, in Hennessey, Oklahoma.

Respectfully,
Burgess Engineering and Testing

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BA/jg