

Project Manual

Bank Lofts Upper Story Housing Pilot Project

302 Broadway; Audubon, Iowa

Owner: Strong America Development Group, LLC

CONSTRUCTION DOCUMENTS FOR PUBLIC HEARING

1 June 2020

The Franks Design Group, P. C.

The Franks Design Group, P. C. 410 First Street Glenwood, Iowa 51534 Phone712-527-3996

Division	Section Title	Pages

PROCHREMENT	ΔNID	CONTRACTING	DOCUMENTS	GROUE

DIVISION 00 - PROCUEMENT AND CONTRACTING REQUIREMENTS 1 000101 PROJECT TITLE PAGE 1 000115 LIST OF DRAWING SHEETS 2 001116 INVITATION TO BID 3 002113 INSTRUCTIONS TO BIDDERS 1 002213 INSTRUCTIONS TO BIDDERS 6 002213 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS 7 002513 PREDID MEETINGS 2 002513 PREDID MEETINGS 2 002600 PROCUREMENT SUBSTITUTION PROCEDURES 4 003113 PRELIMINARY SCHEDULES 1 003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003126 EXISTING HAZARDOUS MATERIAL REPORT 3 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004131 BID SECURITY FORMS 1 004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 004324 ALLOWANCE FORM 2 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP
000115 LIST OF DRAWING SHEETS 2 001116 INVITATION TO BID 3 002113 INSTRUCTIONS TO BIDDERS 1 002113.1 AIA A-701 INSTRUCTIONS TO BIDDERS 6 002213 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS 7 002513 PREBID MEETINGS 2 002600 PROCUREMENT SUBSTITUTION PROCEDURES 4 003113 PRELIMINARY SCHEDULES 1 003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003126 EXISTING HAZARDOUS MATERIAL REPORT 0 003143 PERMIT APPLICATION 1 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004321 ALLOWANCE FORM 2 004322 ALLERNATES FORM 2 004323 ALTERNATES FORM 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012300 ALTERNATES 3 0
000115 LIST OF DRAWING SHEETS 2 001116 INVITATION TO BID 3 002113 INSTRUCTIONS TO BIDDERS 1 002113.1 AIA A-701 INSTRUCTIONS TO BIDDERS 6 002213 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS 7 002513 PREBID MEETINGS 2 002600 PROCUREMENT SUBSTITUTION PROCEDURES 4 003113 PRELIMINARY SCHEDULES 1 003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003126 EXISTING HAZARDOUS MATERIAL REPORT 0 003143 PERMIT APPLICATION 1 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004321 ALLOWANCE FORM 2 004322 ALLERNATES FORM 2 004323 ALTERNATES FORM 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012200 ALTERNATES 3 0
001116 INVITATION TO BID 3 002113 INSTRUCTIONS TO BIDDERS 1 002113.1 AIA A-701 INSTRUCTIONS TO BIDDERS 7 002213 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS 7 002503 PREBID MEETINGS 2 002600 PROCUREMENT SUBSTITUTION PROCEDURES 4 003113 PRELIMINARY SCHEDULES 4 003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003126 EXISTING HAZARDOUS MATERIAL REPORT 1 003143 PERMIT APPLICATION 1 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004313 BID SCURITY FORMS 1 004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012300 ALTERNATES 3 012600 </td
002113.1 AIA A-701 INSTRUCTIONS TO BIDDERS 8 002213 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS 7 002513 PREBID MEETINGS 2 002600 PROCUREMENT SUBSTITUTION PROCEDURES 4 003113 PRELIMINARY SCHEDULES 1 003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003126 EXISTING HAZARDOUS MATERIAL REPORT 3 003143 PERMIT APPLICATION 1 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004313 BID SECURITY FORMS 1 004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 004320 ALTERNATES FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012000 ALTERNATES 3 012300 ALTERNATES 3 012500 SUBSTITUTION PROCEDURES 5 012600
002213 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS 7 002513 PREBID MEETINGS 2 002600 PROCUREMENT SUBSTITUTION PROCEDURES 4 003113 PRELIMINARY SCHEDULES 1 003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003126 EXISTING HAZARDOUS MATERIAL REPORT 1 003143 PERMIT APPLICATION 1 004313 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004313 BID SECURITY FORMS 2 004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012200 ALTERNATES 3 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 5 012600
002513 PREBID MEETINGS 2 002600 PROCUREMENT SUBSTITUTION PROCEDURES 4 003113 PRELIMINARY SCHEDULES 1 003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003123 EXISTING HAZARDOUS MATERIAL REPORT 1 003143 PERMIT APPLICATION 1 004313 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 004323 ALTERNATES FORM 2 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP General Requirements Subgroup DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012200 ALTERNATES 3 012500 SUBSTITUTION PROCEDURES 5 012500 SUBSTITUTION PROCEDURES 3 012900 PAYMENT PROCEDURES 3 0133100 PROJECT MANAGEMENT AND COORDINATION
002600 PROCUREMENT SUBSTITUTION PROCEDURES 4 003113 PRELIMINARY SCHEDULES 1 003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003126 EXISTING HAZARDOUS MATERIAL REPORT 1 003127 EXISTING HAZARDOUS MATERIAL REPORT 1 003128 PERMIT APPLICATION 1 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004313 BID SECURITY FORMS 1 004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP General Requirements Subgroup DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012200 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012900 PAYMENT PROCEDURES 5 012900 PAYMENT PROCEDURES
003113 PRELIMINARY SCHEDULES 1 003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003143 PERMIT APPLICATION 1 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004313 BID SECURITY FORMS 1 004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 3 012500 SUBSTITUTION PROCEDURES 3 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 5 012900 PAYMENT PROCEDURES 6 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
003126 EXISTING HAZARDOUS MATERIAL INFORMATION 1 003126 EXISTING HAZARDOUS MATERIAL REPORT 1 003143 PERMIT APPLICATION 1 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004313 BID SECURITY FORMS 1 004321 ALLOWANCE FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012500 SUBSTITUTION PROCEDURES 5 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013300 SUBMITTAL PROCEDURES 6 013516 ALTERATION PROJECT PROCEDURES 6
003126 EXISTING HAZARDOUS MATERIAL REPORT 003143 PERMIT APPLICATION 1 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004313 BID SECURITY FORMS 1 004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP SPECIFICATIONS GROUP DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 5 012900 PAYMENT PROCEDURES 2 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
003143 PERMIT APPLICATION 1 004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004313 BID SECURITY FORMS 1 004321 ALLOWANCE FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP General Requirements Subgroup DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 2 012600 CONTRACT MODIFICATION PROCEDURES 5 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
004113 BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT) 3 004313 BID SECURITY FORMS 1 004321 ALLOWANCE FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP SPECIFICATIONS GROUP DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 5 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013301 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 7
004313 BID SECURITY FORMS 1 004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP WISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 5 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
004321 ALLOWANCE FORM 2 004323 ALTERNATES FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP WISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 5 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
004323 ALTERNATES FORM 2 006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP General Requirements Subgroup DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 2 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
006000 PROJECT FORMS 3 007300 SUPPLEMENTARY CONDITIONS 4 SPECIFICATIONS GROUP General Requirements Subgroup DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 2 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
SPECIFICATIONS GROUP General Requirements Subgroup DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 012100 ALLOWANCES 012300 ALTERNATES 012500 SUBSTITUTION PROCEDURES 012600 CONTRACT MODIFICATION PROCEDURES 012900 PAYMENT PROCEDURES 013100 PROJECT MANAGEMENT AND COORDINATION 013300 SUBMITTAL PROCEDURES 013516 ALTERATION PROJECT PROCEDURES
SPECIFICATIONS GROUP General Requirements Subgroup DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 012100 ALLOWANCES 012300 ALTERNATES 012500 SUBSTITUTION PROCEDURES 012500 CONTRACT MODIFICATION PROCEDURES 012900 PAYMENT PROCEDURES 013100 PROJECT MANAGEMENT AND COORDINATION 013300 SUBMITTAL PROCEDURES 013516 ALTERATION PROJECT PROCEDURES
DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 012100 ALLOWANCES 012300 ALTERNATES 012500 SUBSTITUTION PROCEDURES 012600 CONTRACT MODIFICATION PROCEDURES 012900 PAYMENT PROCEDURES 013100 PROJECT MANAGEMENT AND COORDINATION 013300 SUBMITTAL PROCEDURES 013516 ALTERATION PROJECT PROCEDURES
DIVISION 01 - GENERAL REQUIREMENTS 011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 2 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
011000 SUMMARY 4 012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 2 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
012100 ALLOWANCES 3 012300 ALTERNATES 2 012500 SUBSTITUTION PROCEDURES 5 012600 CONTRACT MODIFICATION PROCEDURES 2 012900 PAYMENT PROCEDURES 3 013100 PROJECT MANAGEMENT AND COORDINATION 6 013300 SUBMITTAL PROCEDURES 7 013516 ALTERATION PROJECT PROCEDURES 6
012300 ALTERNATES 012500 SUBSTITUTION PROCEDURES 012600 CONTRACT MODIFICATION PROCEDURES 012900 PAYMENT PROCEDURES 013100 PROJECT MANAGEMENT AND COORDINATION 013300 SUBMITTAL PROCEDURES 013516 ALTERATION PROJECT PROCEDURES
012500SUBSTITUTION PROCEDURES5012600CONTRACT MODIFICATION PROCEDURES2012900PAYMENT PROCEDURES3013100PROJECT MANAGEMENT AND COORDINATION6013300SUBMITTAL PROCEDURES7013516ALTERATION PROJECT PROCEDURES6
012600CONTRACT MODIFICATION PROCEDURES2012900PAYMENT PROCEDURES3013100PROJECT MANAGEMENT AND COORDINATION6013300SUBMITTAL PROCEDURES7013516ALTERATION PROJECT PROCEDURES6
012900PAYMENT PROCEDURES3013100PROJECT MANAGEMENT AND COORDINATION6013300SUBMITTAL PROCEDURES7013516ALTERATION PROJECT PROCEDURES6
013100PROJECT MANAGEMENT AND COORDINATION6013300SUBMITTAL PROCEDURES7013516ALTERATION PROJECT PROCEDURES6
013300SUBMITTAL PROCEDURES7013516ALTERATION PROJECT PROCEDURES6
013516 ALTERATION PROJECT PROCEDURES 6
014000 QUALITY REQUIREMENTS 7
015000 TEMPORARY FACILITIES AND CONTROLS 6
016000 PRODUCT REQUIREMENTS
017300 EXECUTION 7
017419 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL 4 017700 CLOSEOUT PROCEDURES 5
017700 CLOSEOUT PROCEDURES 017839 PROJECT RECORD DOCUMENTS 5
THOSE THOSE THEORY DOCUMENTS
Facility Construction Subgroup
raomy construction dubyroup
DIVISION 02 - EXISTING CONDITIONS 024119 SELECTIVE DEMOLITION 4

Bank Lofts TABLE OF CONTENTS 190101 © The Franks Design Group, PC 000000 - 1

DIVISION 04 - N 040322 040323	MASONRY HISTORIC BRICK UNIT MASONRY REPAIR HISTORIC BRICK UNIT MASONRY REPOINTING	6 4
DIVISION 05 - N 055000 055213	METALS METAL FABRICATIONS PIPE AND TUBE RAILINGS	4 6
DIVISION 06 - V 061053 062023	WOOD, PLASTICS, AND COMPOSITES MISCELLANEOUS ROUGH CARPENTRY INTERIOR FINISH CARPENTRY	4 4
DIVISION 07 - T 070150.19 072100 074646 075423 076200 078413 078443 079200	THERMAL AND MOISTURE PROTECTION PREPARATION FOR REROOFING THERMAL INSULATION FIBER-CEMENT SIDING THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING SHEET METAL FLASHING AND TRIM PENETRATION FIRESTOPPING JOINT FIRESTOPPING JOINT SEALANTS	3 4 2 7 9 4 3 4
DIVISION 08 - 0 080314 080352 081433 087100 088000	HISTORIC TREATMENT OF WOOD DOORS HISTORIC TREATMENT OF WOOD WINDOWS STILE AND RAIL WOOD DOORS DOOR HARDWARE GLAZING	6 7 7 6 4
DIVISION 09 - F 090320 092900 093013 099113 099123	HISTORIC TREATMENT OF PLASTER GYPSUM BOARD CERAMIC TILING EXTERIOR PAINTING INTERIOR PAINTING	6 4 7 4 4
DIVISION 10 - S 104416	SPECIALTIES FIRE EXTINGUISHERS	2
DIVISION 12 - F 123530 123661	FURNISHINGS RESIDENTIAL CASEWORK QURATZ AGGLOMERATE COUNTERTOPS	3 2

DIVISION 22 - PLUMBING

220050	BASIC PLUMBING REQUIREMENTS
220090	MINOR PLUMBING DEMOLITION FOR REMODELING
220529	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
220553	IDENTIFICATION FOR PLUMBING AND EQUIPMENT
220719	DOMESTIC PLUMBING INSULATION
221116	DOMESTIC PLUMBING PIPING
221119	DOMESTIC PLUMBING SPECIALTIES
223000	PLUMBING EQUIPMENT
224000	PLUMBING FIXTURES

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)

230050	BASIC HVAC REQUIREMENTS
230090	MINOR HVAC DEMOLITION FOR REMODELING
230529	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
230553	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593	TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713	DUCT INSULATION
230719	HVAC PIPING INSULATION
231123	NATURAL GAS PIPING
232300	REFRIGERANT PIPING
233100	HVAC DUCTS AND CASING
233300	AIR DUCT ACCESSORIES
233423	HVAC POWER VENTILATORS
233700	AIR OUTLETS AND INLETS
235400	FURNACES
238101	TERMINAL HEAT TRANSFER, CONVECTION HEATING, AND COOLING UNITS

DIVISION 26 - ELECTRICAL

260050 BASIC	ELECTRICAL REQUIREMENTS
260051 PRE-BI	D SUBSTITUTION REQUEST FORM
260080 ELECTF	RICAL SCHEDULE OF VALUES
260090 MINOR	ELECTRICAL DEMOLITION FOR REMODELING
260526 GROUN	IDING AND BONDING FOR ELECTRICAL SYSTEMS
260529 HANGE	RS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533 RACEW	/AY AND BOXES FOR ELECTRICAL SYSTEMS
260553 IDENTII	FICATION FOR ELECTRICAL SYSTEMS
262416 PANELI	BOARDS
262701 UTILITY	' SERVICE ENTRANCE
262713 ELECTF	RICITY METERING
262726 WIRING	DEVICES
262816 ENCLO	SED STARTERS AND SWITCHES
262923 VARIAE	BLE FREQUENCY MOTOR CONTROLLER
265100 INTERIO	OR LIGHTING
265600 EXTERI	OR LIGHTING

DIVISION 27 - COMMUNICATIONS

270050	BASIC COMMUNICATIONS REQUIREMENTS
270080	COMMUNICATION SCHEDULE OF VALUES
270090	MINOR COMMUNICATION DEMOLITION FOR REMODELING
270526	GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
270528	PATHWAYS FOR COMMUNICATION SYSTEMS
271005	TELECOMMUNICATIONS CABLING INFRASTRUCTURE
275132	CABLE TELEVISION DISTRIBUTION SYSTEM

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

280050	BASIC ELECTRONIC SAFETY AND SECURITY REQUIREMENTS
280090	MINOR ELECTRONIC SAFETY AND SECURITY DEMOLITION FOR REMODELING
283100	FIRE DETECTION AND ALARM (EXISTING/REMODELING)

END OF TABLE OF CONTENTS

DOCUMENT 000101 - PROJECT TITLE PAGE

- 1.1 PROJECT MANUAL For Agency Review Not for Construction.
 - A. Bank Lofts.
 - B. Strong America Development Group, LLC, Owner.
 - C. Audubon, Iowa.
 - D. Architect Project No. 190101.

The Franks Design Group, P. C.

- E. The Franks Design Group, PC., Architect.
- F. 410 1st Street.
- G. Glenwood, IA 51534.
- H. Phone: 712-527-3996.
- I. Fax: 712-823-0434.
- J. Issued: 1 June 2020 FOR PUBLIC HEARING.
- K. Copyright 2020 The Franks Design Group, PC. All rights reserved.

END OF DOCUMENT 000101

DOCUMENT 000107 - SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

ARCHITECT AND COORDINATING PROFESSIONAL

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly licensed architect under the laws of the State of lowa.

Peter Grosvenor Franks

Printed Name

Printed Name



Signature

Date: 06/10/2020

<u>30 June 2020</u> March 2006; renewed June 2018

License renewal expires Date issued

Pages or sheets covered by this seal:

All sections Division 00 through Division 12, except Structural included as Sheet Specifications.

STRUCTURAL

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly licensed engineer under the laws of the State of Iowa.

Kenneth D. Lathrum	
Printed Name	
Signature	
Date:	
10 June 2020	March 2006; renewed June 2018
License renewal expires	Date issued

Pages or sheets covered by this seal:

Structural specifications issued as Sheet Specifications. See Structural Drawing Sheets.

MECHANICAL

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly licensed professional engineer under the laws of the State of lowa.

Printed Name			
Signature	 	 	
Signature Date:			

License Expires: 12/31/2020 Date issued: 6/7/2005

Pages or sheets covered by this seal:

All sections Division 21 through Division 23

ELECTRICAL

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly licensed professional engineer under the laws of the State of lowa.

Printed Name

Sanakura

Signature Date:

License Expires 12/31/2020

Date issued 06/07/2005

Pages or sheets covered by this seal: All sections Division 26 through Division 28

END OF DOCUMENT 000107

DOCUMENT 000115 - LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

- A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled Construction Documents for Agency Review, dated 1 June 2020, FOR PUBLIC HEARING, as modified by subsequent Addenda and Contract modifications.
- B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:
 - CS COVER SHEET

ARCHITECTURAL

- D-1.1 DEMOLITION PLAN LOWER LEVEL
- D-1.2 DEMOLITION PLAN MAIN LEVEL
- D-1.3 DEMOLITION PLAN UPPER LEVEL
- A-0.1 SITE PLAN
- A-1.1 FLOOR PLAN LOWER LEVEL
- A-1.2 FLOOR PLAN MAIN LEVEL
- A-1.3 FLOOR PLAN UPPER LEVEL
- A-1.4 ROOF PLAN
- A-2.1 EXTERIOR ELEVATIONS SOUTH & EAST
- A-2.2 EXTERIOR ELEVATIONS NORTH & WEST
- A-3.1 BUILDING SECTIONS LONGITUDINAL
- A-3.2 BUILDING SECTIONS LONGITUDINAL
- A-3.3 BUILDING SECTIONS TRANSVERSE
- A-4.1 DETAILS EXISTING CLOCK CAVITY
- A-4.2 DETAILS EXTERIOR RAILINGS, ROOF DRAIN, & DOOR 205.5
- A-5.1 SCHEDULES
- A-6.1 INTERIOR ELEVATIONS ENTRIES AND HALLWAYS
- A-6.2 INTERIOR ELEVATIONS UNIT 201
- A-6.3 INTERIOR ELEVATIONS UNIT 201-202
- A-6.4 INTERIOR ELEVATIONS UNIT 202
- A-6.5 INTERIOR ELEVATIONS UNIT 203
- A-7.1 REFLECTED CEILING PLAN LOWER LEVEL
- A-7.2 REFLECTED CEILING PLAN MAIN LEVEL
- A-7.3 REFLECTED CEILING PLAN UPPER LEVEL

STRUCTURAL

- S-1.1 FOUNDATION FIRST FLOOR FRAMING PLAN & FRAMING DETAILS
- S-1.2 SECOND FLOOR FRAMING PLAN & FRAMING DETAILS
- S-1.3 ROOF FRAMING PLAN & FRAMING DETAILS

MECHANICAL

ME-0.1 COVER SHEET

- PD-1.1 PLUMBING DEMOLITION PLAN
- P-1.1 PLUMBING PLAN
- P-5.1 PLUMBING DETAILS & SCHEDULES
- MD-1.1 MECHANICAL DEMOLITION PLAN
- M-1.1 MECHANICAL PLAN
- M-5.1 MECHANICAL DETAILS
- M-6.1 MECHANICAL SCHEDULES

ELECTRICAL

- ED-1.1 ELECTRICAL DEMOLITION PLAN
- E-1.1 ELECTRICAL POWER PLAN
- E-2.1 ELECTRICAL LIGHTING PLAN
- E-4.1 ELECTRICAL ONE-LINE DIAGRAM
- E-5.1 ELECTRICAL DETAILS
- E-6.1 ELECTRICAL SCHEDULES
- E-6.2 ELECTRICAL SCHEDULES

END OF DOCUMENT 000115

DOCUMENT 001116 - ADVERTISEMENT FOR BIDS AND INVITATION TO BID

1.1 PROJECT INFORMATION

- A. Notice to Bidders: Qualified bidders are invited to submit bids for Project as described in this Document according to the Instructions to Bidders.
- B. Project Identification: Bank Lofts Upper Story Housing Pilot Project.
 - 1. Project Location: 302 Broadway; Audubon, Iowa.
- C. Owner: Strong America Development Group, LLC.
 - 1. Owner's Representative: Matthew Campbell.
- D. Architect: The Franks Design Group, PC.
- E. Project Description: Project consists of Interior rehabilitation of the upper story of an existing two-story historic building.
 - Scope of work includes selective demolition while protecting existing historic elements, Installation of new HVAC systems, Installation of new Electrical systems, Installation of new plumbing systems, Installation of a new interior stair with associated structural work, repair and restoration of existing historic windows, Installation of new Storm Windows, Masonry repair and restoration where indicated, Installation of complete new roof system with thermal insulation, installation of kitchens and bathrooms for three (3) proposed upper story apartments, Installation of new guardrails at entry area stoops, and other work as indicated in the Documents.
 - 2. The Work includes historic buildings being reviewed under Section 106 NHPA and HUD regulations for NEPA (24 CFR Part 58.5[b]). The Work will follow historic guidelines established by the Secretary of the Interior and Standards for the Treatment of Historic Properties.
 - 3. The Project to which the construction work covered by this contract pertains is being assisted by the United States of America and Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance. Related Required Contract Provisions are included, or referenced, in this Project Manual.
 - 4. Work of this Contract is not subject to compliance with The Davis-Bacon and Related Acts.
- F. Construction Contract: Bids will be received for the following Work:
 - 1. General Contract (all trades).

1.2 BID SUBMITTAL AND OPENING

- A. Owner will receive sealed bids until the bid time and date at the location indicated below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:
 - 1. Bid Date: 14 July 2020.
 - 2. Bid Time: 2:00 p.m. local time.

- 3. Location: Audubon City Hall, 410 North Park Place; Audubon, IA 50025.
- B. Bids will be thereafter publicly opened and read aloud.

1.3 BID SECURITY

A. Bid security shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of 30 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.4 PREBID CONFERENCE

A. A prebid conference for all bidders will be held on 24 June 2020 at 10:00 a.m., local time. Prospective bidders are requested to attend. Due to COVID-19 concerns, this meeting will be conducted via ZOOM online platform, with on-site visit times available by appointment.

1.5 DOCUMENTS

- A. Printed Procurement and Contracting Documents: Obtain after 10 June 2020, by contacting A&D Technical Supply, Omaha Office, 4320 South 89th Street, Omaha, NE 68127, Toll free: 800-228-2753 or 402-592-4950.
 - 1. Deposit: \$100.00 payable to the Owner.
 - 2. Documents will be loaned to qualified entities upon receipt of the deposit per set as deposit or by presenting an MBI, ABC, NECA, OBC or other pre-approved non-cash plan deposit card. Checks for plan deposit shall be made payable to Strong America Development Group, LLC, and if mailed, shall be addressed to A & D Technical Supply Co. at the above location. Deposit will be refunded to an entity if complete documents are delivered to or returned postage paid and in reusable condition to A & D Technical Supply Co. within 14 days after bids are due. Documents are the property of Strong America Development Group, LLC and entities receiving documents shall be financially liable for them being returned in a reusable condition within the time stated above as required by lowa Code 26.3(2).
 - 3. The Documents will also be available on compact disc in PDF format, or by digital download at no charge to prospective bidders, subcontractor bidders, suppliers, and contractor plan room services.
 - 4. Shipping: Documents issued to prospective bidders, subcontractor bidders, suppliers, and contractor plan room services will be shipped at Owner expense, per lowa Code requirements.
 - 5. It is the desire of the Owner and Architect to reduce the number of printed sets to a minimum therefore the Architect encourages Contractors to review the project details to confirm their interest prior to requesting bid sets.
- B. Online Procurement and Contracting Documents: Obtain access after 10 June 2020 by contacting A&D Technical Supply, Omaha Office, 4320 South 89th Street, Omaha, NE 68127. Bidding Documents may also be viewed online at www.adtechsupply.com. Online access will be provided to all registered bidders and suppliers. Bidders are encouraged to check this website for the current list of plan holders and for notice of any late-issued Addenda before submitting a bid.
- C. Viewing Procurement and Contracting Documents: Examine after 12 June 2020, at the locations below:
 - Audubon City Hall,
 410 North Park Place
 Audubon, IA 50025116
 - 2. Sioux City Construction League

3900 Stadium Drive, Sioux City, IA 51106

Phone: (712) 255-9730

Master Builders of Iowa/Construction Update Plan Room
 221 Park Street PO Box 695 Des Moines, IA 50303

Phone: (515) 288-8904

4. McGraw Hill / Bee Line & Blue 2507 Ingersoll Avenue Des Moines, IA 50312 Phone: (515) 244-1611

5. Lincoln Builders Bureau 5910 South 58th Street, Suite "C" Lincoln, Nebraska 68516 Phone: (402) 421-8332

- 6. Construction Update Plan Rooms
 For more information, visit http://www.mbionline.com
- 7. Other industry plan rooms as directed by the Owner.

1.6 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. Bidders shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time. Work is subject to liquidated damages.

1.7 BIDDER'S QUALIFICATIONS

- A. Bidders must be prequalified by Owner.
- B. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, a separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.

END OF DOCUMENT 001116

DOCUMENT 002113 - INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

- A. AIA Document A701, "Instructions to Bidders," is hereby incorporated into the Procurement and Contracting Requirements by reference.
 - 1. A copy of AIA Document A701, "Instructions to Bidders," is bound in this Project Manual.

END OF DOCUMENT 002113



Instructions to Bidders

for the following Project: (Name, location, and detailed description)

Bank Lofts Upper-Story Adaptive Re-Use and Rehabilitation Project 302 Broadway Avenue, Audubon, Iowa Adaptive re-use and rehabilitation of the upper level of the existing two-story building to be three apartments.

THE OWNER:

(Name, legal status, address, and other information)

Strong America Development Group, Limited Liability Company 302 Broadway
Audubon, IA 50025

THE ARCHITECT:

(Name, legal status, address, and other information)

The Franks Design Group, P. C. 410 First Street Glenwood, Iowa 51534 Telephone Number: (712) 527-3996

TABLE OF ARTICLES

- 1 DEFINITIONS
- 2 BIDDER'S REPRESENTATIONS
- 3 BIDDING DOCUMENTS
- 4 BIDDING PROCEDURES
- 5 CONSIDERATION OF BIDS
- 6 POST-BID INFORMATION
- 7 PERFORMANCE BOND AND PAYMENT BOND
- 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

ARTICLE 1 DEFINITIONS

- § 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.
- § 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.
- § 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.
- § 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.
- § 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.
- § 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.
- § 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.
- § 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.
- § 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

- § 2.1 By submitting a Bid, the Bidder represents that:
 - .1 the Bidder has read and understands the Bidding Documents;
 - .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
 - .3 the Bid complies with the Bidding Documents;
 - .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
 - .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
 - .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

Per Invitation To Bid.

- § 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.
- § 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.
- § 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.
- § 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

- § 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.
- § 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids. (Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

Submitted in writing directly to the Architect, or via email to the Architect, using forms provided in Supplementary Instructions To Bidders, on or before deadline established by the Architect.

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 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.

§ 3.3.2 Substitution Process

- § 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.
- § 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form if one is provided in the Bidding Documents.
- § 3.3.2.3 If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.
- § 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
- § 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

Registered planholders will receive addenda via fax from Architect's reprographic house with printed copy, via postal, mail to follow.

- § 3.4.2 Addenda will be available where Bidding Documents are on file.
- § 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.
- § 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

- § 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.
- § 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.
- § 4.1.3 Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.
- § 4.1.4 Edits to entries made on paper bid forms must be initialed by the signer of the Bid.
- § 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.
- § 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.
- § 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.
- § 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by the following bid security: (Insert the form and amount of bid security.)

Bid Bond or other permitted Bid Security in the amount of 5% of the base bid amount.

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising

thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

- § 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.
- § 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning30days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

Paper Copy only, using forms included in the Project Manual

- § 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.
- § 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.
- § 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.
- § 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.4 Modification or Withdrawal of Bid

- § 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.
- § 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.
- § 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows:

 (State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)

Per Supplementary Instructions To Bidders.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305TM, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

- § 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:
 - .1 a designation of the Work to be performed with the Bidder's own forces;
 - .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
 - .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.
- § 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.
- § 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.
- § 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

- § 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.
- § 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.
- § 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.
- § 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.
- (If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

- § 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.
- § 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.
- § 7.2.3 The bonds shall be dated on or after the date of the Contract.
- § 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

- § 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:
 - .1 AIA Document A101™_2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

- 2 AIA Document A101™—2017, Exhibit A, Insurance and Bonds, unless otherwise stated below. (Insert the complete AIA Document number, including year, and Document title.)
- 3 AIA Document A201™—2017, General Conditions of the Contract for Construction, unless otherwise stated below.

(Insert the complete AIA Document number, including year, and Document title.)

.4 AIA Document E203™—2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:

(Insert the date of the E203-2013.)

	Number	Title	Date	
	See Project Manual			
6	Specifications			
	Section	Title	Date	Pages
	See Project Manual			
.7	Addenda:			
	Number	Date	Pages	
.8	Other Exhibits:			
.0	(Check all boxes that apply and in	nclude appropriate inf	ormation identifying the	exhibit wh
· /45	remired)		- (1985년 - 기계 시간) - 12 년 17	
	required.)			
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DOCUMENT 002213 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1.1 INSTRUCTIONS TO BIDDERS

- A. Instructions to Bidders for Project consist of the following:
 - 1. AIA Document A701, "Instructions to Bidders," a copy of which is bound in this Project Manual.
 - 2. The following Supplementary Instructions to Bidders that modify and add to the requirements of the Instructions to Bidders.

1.2 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, GENERAL

A. The following supplements modify AIA Document A701, "Instructions to Bidders." Where a portion of the Instructions to Bidders is modified or deleted by these Supplementary Instructions to Bidders, unaltered portions of the Instructions to Bidders shall remain in effect.

1.3 ARTICLE 1 - DEFINITIONS

A. All definitions set forth in the "General Conditions of the Contract" are applicable to these Instructions to Bidders.

1.4 ARTICLE 2 - BIDDER'S REPRESENTATIONS

- A. Add Section 2.1.3.1:
 - 1. 2.1.3.1 The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.
- B. Add Section 2.1.5:
 - 2.1.5 The Bidder is a properly licensed Contractor according to the laws and regulations of The State
 of lowa and meets qualifications indicated in the Procurement and Contracting Documents.
- C. Add Section 2.1.6:
 - 1. 2.1.6 The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

1.5 ARTICLE 3 - BIDDING DOCUMENTS

- A. 3.2 Interpretation or Correction of Procurement and Contracting Documents:
 - 1. Add Section 3.2.2.1:
 - 3.2.2.1 Submit Bidder's Requests for Interpretation using form bound in the Project Manual and available from the Architect, upon request.
- B. 3.4 Addenda:

- 1. Delete Section 3.4.3 and replace with the following:
 - a. 3.4.3 Addenda may be issued at any time prior to the receipt of bids.
- 2. Add Section 3.4.4.1:
 - a. 3.4.4.1 Owner may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:
 - 3.4.4.1.1 Information received as part of the Bid indicates that the Bid, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.
 - 3.4.4.1.2 Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of Owner, affect the Contract Sum or Contract Time.

1.6 ARTICLE 4 - BIDDING PROCEDURES

- A. 4.1 Preparation of Bids:
 - 1. Add Section 4.1.1.1:
 - a. 4.1.1.1 Printable electronic Bid Forms and related documents are available from Architect.
 - 2. Add Section 4.1.8:
 - a. 4.1.8 The Bid shall include unit prices when called for by the Procurement and Contracting Documents. Owner may elect to consider unit prices in the determination of award. Unit prices will be incorporated into the Contract.
 - 3. Add Section 4.1.9:
 - a. 4.1.9 Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates or unit prices, failure to complete entries in all blanks in the Bid Form, or inclusion by the Bidder of any alternates, conditions, limitations or provisions not called for.
 - 4. Add Section 4.1.10:
 - a. 4.1.10 Bids shall include sales and use taxes. Contractors shall show separately with each monthly payment application the sales and use taxes paid by them and their subcontractors in the form indicated. Reimbursement of sales and use taxes, if any, shall be applied for by Owner for the sole benefit of Owner.
- B. 4.4 Modification or Withdrawal of Bids:
 - 1. Add the following sections to 4.4.2:
 - a. 4.4.2.1 Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Bidder. Authorized persons are those so identified in the Bidder's corporate bylaws, specifically empowered by the Bidder's charter or similar legally binding document acceptable to Owner, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to Owner at the time of seeking modifications or withdrawal of the Bid.

- b. 4.4.2.2 Owner will consider modifications to a bid written on the sealed bid envelope by authorized persons when such modifications comply with the following: the modification is indicated by a percent or stated amount to be added to or deducted from the Bid; the amount of the Bid itself is not made known by the modification; a signature of the authorized person, along with the time and date of the modification, accompanies the modification. Completion of an unsealed bid form, awaiting final figures from the Bidder, does not require power of attorney due to the evidenced authorization of the Bidder implied by the circumstance of the completion and delivery of the Bid.
- C. 4.5 Break-Out Pricing Bid Supplement:
 - 1. Add Section 4.5:
 - a. 4.5 Provide detailed cost breakdowns no later than two business days following Architect's request.
- D. 4.6 Subcontractors, Suppliers, and Manufacturers List Bid Supplement:
 - 1. Add Section 4.6:
 - 4.6 Provide list of major subcontractors, suppliers, and manufacturers furnishing or installing products no later than two business days following Architect's request. Include those subcontractors, suppliers, and manufacturers providing work totaling five percent or more of the Bid amount. Do not change subcontractors, suppliers, and manufacturers from those submitted without approval of Architect.
- 1.7 ARTICLE 5 CONSIDERATION OF BIDS
 - A. 5.2 Rejection of Bids:
 - 1. Add Section 5.2.1:
 - a. 5.2.1 Owner reserves the right to reject a bid based on Owner's and Architect's evaluation of qualification information submitted following opening of bids. Owner's evaluation of the Bidder's qualifications will include: status of licensure and record of compliance with licensing requirements, record of quality of completed work, record of Project completion and ability to complete, record of financial management including financial resources available to complete Project and record of timely payment of obligations, record of Project site management including compliance with requirements of authorities having jurisdiction, record of and number of current claims and disputes and the status of their resolution, and qualifications of the Bidder's proposed Project staff and proposed subcontractors.
 - B. 5.3 Acceptance of Bid (Award):
 - 1. Add Section 5.3.3:
 - a. Chapter 26 of the Code of Iowa "Public Construction Bidding" shall govern submittal, opening, and award of bids. By virtue of statutory authority, a preference will be given to products and provisions grown and coal produced within the State Of Iowa and to Iowa domestic labor. A preference will be given to resident Bidders in Accordance with Chapter 73 of the Code of Iowa.

190101

1.8 ARTICLE 6 - POSTBID INFORMATION

- A. 6.1 Contractor's Qualification Statement:
 - 1. Add Section 6.1.1:
 - a. 6.1.1 Submit Contractor's Qualification Statement no later than two business days following Architect's request.
- B. 6.3 Submittals:
 - 1. Add Section 6.3.1.4:
 - a. 6.3.1.4 Submit information requested in Sections 6.3.1.1, 6.3.1.2, and 6.3.1.3 no later than two business days following Architect's request.

1.9 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

- A. 7.1 Bond Requirements:
 - 1. Add Section 7.1.1.1:
 - a. 7.1.1.1 Both a Performance Bond and a Payment Bond will be required, each in an amount equal to 100 percent of the Contract Sum.
- B. 7.2 Time of Delivery and Form of Bonds:
 - 1. Delete the first sentence of Section 7.2.1 and insert the following:
 - a. The Bidder shall deliver the required bonds to Owner no later than 10 days after the date of Notice of Intent to Award and no later than the date of execution of the Contract, whichever occurs first. Owner may deem the failure of the Bidder to deliver required bonds within the period of time allowed a default.
 - 2. Delete Section 7.2.3 and insert the following:
 - a. 7.2.3 Bonds shall be executed and be in force on the date of the execution of the Contract.

1.10 ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. The Agreement for the Work will be prepared by the Architect and written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.

1.11 ARTICLE 9 - EXECUTION OF THE CONTRACT

- A. Add Article 9:
 - 1. 9.1.1 Subsequent to the Notice of Intent to Award, and within 10 days after the prescribed Form of Agreement is presented to the Awardee for signature, the Awardee shall execute and deliver the Agreement to Owner through Architect, in such number of counterparts as Owner may require.
 - 2. 9.1.2 Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.

- 3. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement. 9.1.4 - In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to
- 4. either award the Contract to the next responsible bidder or re-advertise for bids.

END OF DOCUMENT 002213

(RFI FORM FOLLOWS)

BANK LOFTS UPPER STORY HOUSING PILOT PROJECT

(Use separate form for each request.)

DATE:			
TO: The Franks Design Group, PC 410 First Street Glenwood, Iowa 51534 Phone: (712) 527-3996	FROM:		
PROJECT: BANK LOFTS UPPER STORY HOUSING PILOT PROJECT	REQUEST #		
REQUEST FOR INTERPRETATION DESCRIPTION: (Fully describe the question or the type of information requested.)			
REFERENCES/ATTACHMENTS: (List specific documents researched when seeking the information requested.)			
SPECIFICATIONS: DRAWINGS:	OTHER:		
SENDER'S RECOMMENDATION: (If RFI concerns an existing conditions or construction condition the sender may provide a recommended solution, or a recommended means for addressing the condition during the bidding process.)			
RECEIVER'S REPLY For use by the Architect:			
[] Approved as noted [] Not Appr	roved [] Received too late for consideration		
Remarks:			
Signed	Date		
Note: This reply is informational only and not to be considered a modific Addendum.	ication to the Contract Documents unless included in an issued		

Bank Lofts 190101

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DOCUMENT 002513 - PREBID MEETINGS

1.1 PREBID MEETING

- A. Architect will conduct a Prebid meeting as indicated below:
 - 1. Meeting Date: 24 June 2020.
 - 2. Meeting Time: 10:00 a.m., local time.
 - 3. Location: Due to COVID-19 concerns, this meeting will be conducted via ZOOM online platform, with on-site visit times available by appointment.
- B. Attendance:
 - 1. Prime Bidders: Attendance at Prebid meeting is recommended.
 - 2. Subcontractors: Attendance at Prebid meeting is recommended.
- C. Bidder Questions: Submit written questions to be addressed at Prebid meeting minimum of two business days prior to meeting.
- D. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:
 - 1. Procurement and Contracting Requirements:
 - a. Advertisement for Bids.
 - b. Instructions to Bidders.
 - c. Bidder Qualifications.
 - d. Bonding.
 - e. Insurance.
 - f. Bid Security.
 - g. Bid Form and Attachments.
 - h. Bid Submittal Requirements.
 - i. Bid Submittal Checklist.
 - j. Notice of Award.
 - 2. Communication during Bidding Period:
 - a. Obtaining documents.
 - b. Bidder's Requests for Information.
 - c. Bidder's Substitution Request/Prior Approval Request.
 - d. Addenda.
 - 3. Contracting Requirements:
 - a. Agreement.
 - b. The General Conditions.
 - c. The Supplementary Conditions.
 - d. Other Owner requirements.
 - 4. Construction Documents:
 - a. Scopes of Work.

- b. Temporary Facilities.
- c. Use of Site.
- d. Work Restrictions.
- e. Alternates, Allowances, and Unit Prices.
- f. Substitutions following award.
- 5. Separate Contracts:
 - a. Work by Owner.
 - b. Work of Other Contracts.
- 6. Schedule:
 - a. Project Schedule.
 - b. Contract Time.
 - c. Liquidated Damages.
 - d. Other Bidder Questions.
- 7. Site/facility visit or walkthrough.
- 8. Post-Meeting Addendum.
- E. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees and others known by the issuing office to have received a complete set of Procurement and Contracting Documents. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.
 - 1. Sign-in Sheet: Minutes will include list of meeting attendees.

END OF DOCUMENT 002513

DOCUMENT 002600 - 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 012500 "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. 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 one copies of each written Procurement Substitution Request, using form bound in Project Manual.

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 D	OCUMENT 002600
	(SUBSTITUTION REQUEST FORM FOLLOWS)
Dank Laft	DDOCLIDEMENT CLIDSTITUTION

BANK LOFTS UPPER STORY HOUSING PILOT PROJECT PROSPECTIVE BIDDER'S SUBSTITUTION REQUEST FORM 002600A — FOR USE <u>DURING</u> THE BIDDING PHASE

(Use separate form for each request.)

Reque	st No.	
T0:	The Franks Design Group, PC 410 1st Street Glenwood, Iowa 51534 Phone: (712) 527-3996 FAX: (712) 823-0434	
ATTN:		
CONTI	RACTOR:	
SPECI	FIED ITEM:	
Specification Section:		Specification Section Page:
Specif	ication Article/Paragrah:	Drawing/Detail Number(s):
The ur	dersigned request consideration of the following,	
PROP	OSED SUBSTITUTION (include trade name and mod	del # of proposed substitution and manufacturer's contact information:
	ed data includes description, specifications, drawi st; applicable portions of data are clearly identified.	ngs, photographs, performance and test data adequate for evaluation o
Attach install		Contract Documents that proposed substitution will require for its prope
The ur	ndersigned certifies that the following paragraphs, t	inless modified by attachments, are correct:

- 2. Proposed Substitution does not affect dimensions shown on Drawings.
- 3. Proposed Substitution does not require revisions to mechanical or electrical work.

determined to be equal or superior in all respecs to specified product

4. The undersigned will pay for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by requested Substitution.

1. Proposed Substitution has checked and coordinated with Contract Documents, and has been fully investigated and

- 5. Proposed Substitution will have no adverse affect on other trades, construction schedule, or specified warranty requirements.
- 6. Maintenance and service parts will be locally available for proposed substitution.

- OVER -

Date:

The undersigned further states that the f specified item.	function, appearance, and quality of proposed Substitution are equivalent or superior to
Attachments: The attached data is furnis	hed herewith for evaluation of the proposed substitution.
[] Catalog [] Drawings [] Samples	[] Reports [] Tests [] Other
Submitted by: (Contractor)	By:(Authorized legal_signature)
Address	
Telephone:	
For use by the Architect:	
[] Approved [] Approved as noted	[] Not Approved [] Received too late for consideration
Remarks:	
Signed	Date

1.1 PROJECT SCHEDULE

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but do not affect Contract Time requirements. This Document and its attachments are not part of the Contract Documents.
- B. Available Project information includes the following:
 - 1. Preliminary Project Schedule.
 - a. 24 February 2020 Submit Documents for IEDA review and approval.
 - b. 24 March 2020 –IEDA Section 106 historic approval.
 - c. 4 May 2020 Release of Funds.
 - d. 11 May 2020 City to set date for Public Hearing.
 - e. 8 June 2020 City Council Meeting with Public Hearing.
 - 10 June 2020 Bid Documents Released and Notification to bidding community via Master Builders of Iowa.
 - g. Week of 15 June 2020 Locally publish invitation to bid in newspaper of record.
 - h. 24 June 2020 Pre-bid meeting tentatively via zoom meeting with scheduled on-site walk throughs of less than eight prospective bidders at a time.
 - i. 30 June 2020; 5:00 PM local time Close of period for bidder's submission of questions, requests for clarification, and procurement substitution requests.
 - j. 2 July 2020 Addendum including Pre-Bid meeting minutes and questions received by deadline.
 - k. 14 July 2020 Bid opening.
 - I. 17 July 2020 Notice of Intent To Award.
 - m. 28 July 2020 Target date for execution of reviewed and approved General Construction Contract.
 - n. To Be Determined Preconstruction Meeting.
 - o. 180 calendar days from Notice to Proceed Construction through Substantial Completion (provisionally 8/3/20 to 1/30/21).

C. Related Requirements:

- 1. Document 004113 "Bid Form Stipulated Sum (Single-Prime Contract).
- 2. Section 011000 "Summary" for phased construction requirements.

END OF DOCUMENT 003113

DOCUMENT 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. An existing asbestos report for Project, prepared by Blohm Inspection/Environmental Services, Inc., dated 18 July 2019, is available for viewing as appended to this Document.
- C. Related Requirements:
 - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF DOCUMENT 003126

BLOHM

INSPECTION/ENVIRONMENTAL SERVICES INC.

805 3rd Ave. Audubon, Ia 50025 712-304-0744 rblohminspections@gmail.com

Date: July 18, 2019

Att: Matt Campbell

302 Broadway Building Grant Renovation

114 N. Chestnut St. Audubon, Ia. 50025

RE: Asbestos Inspection of 302 Broadway Audubon, Ia. 50025

Please consider this you're billing statement.

Asbestos Inspection \$800.00 Laboratory Fees 45 samples x \$12.00 540.00 **Total amount due:** \$1340.00

Payable to: Blohm Inspection/Environmental Services Inc.

Randy Blohm 805 3rd. Ave.

Audubon, Ia. 50025

Randy Blohm Asbestos Inspector #IA18-0855

BLOHM INSPECTION/ENVIRONMENTAL SERVICES INC.

805 3rd. Ave. Audubon, Ia. 50025 712-304-0744 rblohminspections@gmail.com

Date: July 18, 2019

Att: Matt Campbell 302 Broadway Building Grant Renovation Audubon, Ia. 50025

RE: Asbestos Inspection of 302 Broadway Audubon, Ia. 50025

Dear, Matt Campbell:

An asbestos inspection was conducted July 9, 2019 a two story commercial building located at 302 Broadway. Audubon, Ia. 50025. I Randy Blohm made a thorough inspection of the structure for the presence of asbestos-containing materials, suspect materials were present with forty five bulk samples taken. Sample analysis of nine samples by Hygienic Laboratory using PLM-Polarized Light Microscopy tested **positive** for the presence of Asbestos.

Sample numbers and Locations of asbestos containing material.

- #4 Basement south end on floor, cloth pipe wrap. (approx... 40 lin. ft.)
- #8 2nd. Story floor south hallway ceiling, plaster skim coat material. (approx. 150 sq. ft.)
- #9 2nd. Story floor north hallway ceiling, plaster skim coat material. (approx. 150 sq. ft.)
- #22 North apt. closet, green vinyl floor w/white backing no mastic present. (approx. 30 aq. ft.)
- #24 North apt. bath, 9" x 9" beige floor tile. (mastic negative) (approx. 36 sq. ft.)
- #30 Exterior north apt. (3) west & (3) east window sashes, glazing putty.
- #32 Exterior south apt. (2) south & (5) west window sashes, old glazing putty under new glazing.
- #38 Exterior south roof slopes, 2nd white membrane layer under yellow foam, black tar material between white fibrous membrane layer and rubber membrane layer. Entire original upper roof south and north slopes that drain to center.
- #41 Exterior south slope west parapet wall cap only, black & gray tar composite layer.

Note: Only basement, 2nd story stairway, entire 2nd. floor, and two roof levels was inspected for asbestos.

Sample numbers of asbestos containing material are highlighted in red on Laboratory Results Report with location stated on Chain of Custody form.

If you have any additional questions, please feel free to contact me at (712) 304-0744.

Karly BAL

Sincerely,

Randy Blohm Asbestos Inspector

Asbestos License# IA18-0855



Environmental Hazards Services, L.L.C. 7469 Whitepine Rd Richmond, VA 23237

Telephone: 800.347.4010

Asbestos Bulk Analysis Report

Report Number: 19-07-02389

Client:

Blohm Inspection/Env. Services Inc.

805 3rd Ave.

Audubon, IA 50025

Received Date: 07/15/2019

Analyzed Date: 07/17/2019

Reported Date: 07/18/2019

Project/Test Address: 302 Broadway; Audubon, Iowa

Client Number:

16-6224

Laboratory Results

Fax Number:

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-07-02389-001	1		White Pliable; Homogeneous	NAD	100% Non-Fibrous
19-07-02389-002	2		White Granular; Homogeneous	NAD	4% Hair 96% Non-Fibrous
19-07-02389-003	3		White Granular; Homogeneous	NAD	4% Hair 96% Non-Fibrous
19-07-02389-004	4		Beige Fibrous; Homogeneous	75% Chrysotile	25% Non-Fibrous
			Total Asbestos	75%	
19-07-02389-005	5		Beige Granular; Homogeneous	NAD	4% Hair 96% Non-Fibrous

Client Number:

16-6224

Project/Test Address: 302 Broadway; Audubon, Iowa

Report Number:

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-07-02389-006	6		Beige/Blue Paint-Like; White Brittle; Brown Granular; Inhomogeneou	NAD s	100% Non-Fibrous
19-07-02389-007	7		Beige/Blue Paint-Like; White Brittle; Brown Granular; Inhomogeneou	NAD	100% Non-Fibrous
19-07-02389-008	8		Beige/Brown Granular; Gold Platelets; Inhomogeneous	Trace <1% Trem/Actin*	100% Non-Fibrous
Tremolite/Actinolit	e Series Ashestos	present in skin	Total Asbesto	s: Trace <1%	
19-07-02389-009	9	present in skill	Beige Paint-Like; Beige/Brown Granular; Gold Platelets; Inhomogeneous	Trace <1% Trem/Actin*	100% Non-Fibrous
			Total Asbesto	s: Trace <1%	
Tremolite/Actinolit	e Series Asbestos	present in skin	n coat material.		ANNELS STATEMENT STATEMENT ST
19-07-02389-010	10		White Granular; Homogeneous	NAD	4% Hair 96% Non-Fibrous
19-07-02389-011	11		Brown Fibrous; White Brittle; Brown Granular; Inhomogeneous	NAD	45% Cellulose 55% Non-Fibrous
			Gray Granular;	NAD	4% Synthetic

Client Number:

16-6224

Project/Test Address: 302 Broadway; Audubon, Iowa

Report Number:

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-07-02389-013	13		Brown Vinyl-Like; Black Fibrous; Inhomogeneous	NAD	35% Cellulose 65% Non-Fibrous
No mastic presen	t				
19-07-02389-014,	A 14	Flooring	Brown Vinyl-Like; Black Fibrous; Inhomogeneous	NAD	35% Cellulose 65% Non-Fibrous
19-07-02389-014	B 14	Mastic	Tan Adhesive; Homogeneous	NAD	5% Cellulose 95% Non-Fibrous
19-07-02389-015	15		Black Fibrous; Homogeneous	NAD	45% Cellulose 55% Non-Fibrous
No mastic present	t				
19-07-02389-016	16		White Paint-Like; Tan Brittle; Inhomogeneous	NAD	100% Non-Fibrous
19-07-02389-017	17		Black Fibrous; Homogeneous	NAD	45% Cellulose 55% Non-Fibrous
No mastic present	i				
19-07-02389-018	18		White Paint-Like; Tan Brittle; Inhomogeneous	NAD	100% Non-Fibrous
19-07-02389-019	19		White Granular; Homogeneous	NAD	4% Hair 96% Non-Fibrous

Client Number:

16-6224

Project/Test Address: 302 Broadway; Audubon, Iowa

Report Number:

Number	ent Sample Number	Layer Type	Lab Gross Description A	sbestos	Other Materials
19-07-02389-020	20		Red Paint-Like; Brown Fibrous; White Brittle; Brown Granular; Inhomogeneous	NAD	55% Cellulose 45% Non-Fibrous
19-07-02389-021	21		Green Vinyl-Like; Black Fibrous; Inhomogeneous	NAD	35% Cellulose 65% Non-Fibrous
No mastic present					
19-07-02389-022	22		Green Vinyl-Like; Gray Fibrous; Inhomogeneous —	20% Chrysotile	80% Non-Fibrous
			Total Asbestos:	20%	
Chrysotile present in		No mastic p	resent.)		
19-07-02389-023	23		White Paint-Like; Brown	NAD	90% Cellulose
70 07 02000 020	20		Fibrous; Inhomogeneous	TV IS	10% Non-Fibrous
19-07-02389-024A	24	Tile		2% Chrysotile	
		Tile	Fibrous; Inhomogeneous Beige/White Vinyl;	2% Chrysotile	10% Non-Fibrous
		Tile	Fibrous; Inhomogeneous Beige/White Vinyl; Homogeneous	2% Chrysotile	10% Non-Fibrous
19-07-02389-024A	24		Beige/White Vinyl; Homogeneous Total Asbestos: Black Adhsive;	2% Chrysotile	10% Non-Fibrous 98% Non-Fibrous 5% Cellulose

Client Number:

16-6224

Project/Test Address: 302 Broadway; Audubon, Iowa

Report Number:

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-07-02389-027	27		Green Paint-Like; Brown Fibrous; Gray Granular; Inhomogeneous	NAD	35% Cellulose 65% Non-Fibrous
19-07-02389-028	28		Black Vinyl-Like; Black Fibrous; Inhomogeneous	NAD	35% Cellulose 65% Non-Fibrous
			r ibrous, imiornogeneous		00% Non-Fibrous
No mastic present					
19-07-02389-029	29		White Paint-Like; White Pliable; Inhomogeneous	NAD	100% Non-Fibrous
19-07-02389-030	30		White Paint-Like; Beige Brittle; Inhomogeneous	2% Chrysotile	98% Non-Fibrous
				20/	
Chrysotile present	throughout samp		Total Asbestos	5: 2%	
19-07-02389-031	31		White Paint-Like; White	NAD	100% Non-Fibrous
			Pliable; Inhomogeneous		100% 11011 1151003
19-07-02389-032 <i>F</i>	A 32	Glazing	White Paint-Like; Off-	2% Chrysotile	98% Non-Fibrous
			White Brittle; Inhomogeneous		
			Total Asbestos	s: 2%	
Chrysotile present	throughout samp	le.)			
19-07-02389-032E	32	Caulk	White Paint-Like; White Pliable; Inhomogeneous	NAD	100% Non-Fibrous
19-07-02389-033	33		Gray/White Pliable; Yellov Foam-Like;	v NAD	100% Non-Fibrous
			Inhomogeneous		

Client Number:

16-6224

10-0224

Report Number:

19-07-02389

Project/Test Address: 302 Broadway; Audubon, Iowa

Lab Sample Number	Client Sample Number	Layer Type La	b Gross Description	Asbestos	Other Materials
19-07-02389-034	34		Gray/White Pliable; Homogeneous	NAD	5% Synthetic 95% Non-Fibrous
19-07-02389-035	35		Black Tar-Like; Fibrous; Inhomogeneous	NAD	30% Cellulose 70% Non-Fibrous
19-07-02389-036	36		Black Tar-Like; Fibrous; Inhomogeneous	NAD	30% Cellulose 70% Non-Fibrous
19-07-02389-037	37	i	White/Gray Pliable; Yellov Foam-Like; Inhomogeneous	w NAD	100% Non-Fibrous
19-07-02389-038	38		White/Gray Pliable; Black Tar-Like; Inhomogeneous		2% Synthetic 95% Non-Fibrous
Ohmandila aanaa aa	i i a la a Wasan a da da	W. (Total Asbestos	~	
19-07-02389-039	t in tar-like materia		membrane and white fibro Black Tar-Like; Fibrous; Inhomogeneous	NAD	35% Cellulose 65% Non-Fibrous
19-07-02389-040	40	5	White/Gray Pliable; Black Tar-Like; Fibrous; Inhomogeneous	NAD	30% Cellulose 70% Non-Fibrous
19-07-02389-041	41		Black Tar-Like; Fibrous;	5% Chrysotile	8% Cellulose 87% Non-Fibrous

Client Number:

16-6224

Project/Test Address: 302 Broadway; Audubon, Iowa

Report Number:

19-07-02389

Lab Sample Number	Client Sample Number	Layer Type	Lab Gross Description	Asbestos	Other Materials
19-07-02389-042	42		Black Tar-Like; Granular Homogeneous	r; NAD	10% Cellulose 5% Fibrous Glass 85% Non-Fibrous

QC Sample:

35-M22014-4

QC Blank:

SRM 1866 Fiberglass

Reporting Limit: 1% Asbestos

Method:

EPA Method 600/R-93/116, EPA Method 600/M4-82-020

Analyst:

Keleigh King

Reviewed By Authorized Signatory:

Tasha Eaddy QA/QC Clerk

Jasha Faddy

The condition of the samples analyzed was acceptable upon receipt per laboratory protocol unless otherwise noted on this report. Each distinct component in an inhomogeneous sample was analyzed separately and reported as a composite. Results represent the analysis of samples submitted by the client. Sample location, description, area, volume, etc., was provided by the client. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of the Environmental Hazards Service, L.L.C. California Certification #2319 NY ELAP #11714 NVLAP #101882-0 VELAP 460172. All information concerning sampling location, date, and time can be found on Chain-of-Custody. Environmental Hazards Services, L.L.C. does not perform any sample collection.

Environmental Hazards Services, L.L.C. recommends reanalysis by point count (for more accurate quantification) or Transmission Electron Microscopy (TEM), (for enhanced detection capabilities) for materials regulated by EPA NESHAP (National Emission Standards for Hazardous Air Pollutants) and found to contain less than ten percent (<10%) asbestos by polarized light microscopy (PLM). Both services are available for an additional fee.

400 Point Count Analysis, where noted, performed per EPA Method 600/R-93/116 with a Reporting Limit of 0.25%.

* All California samples analyzed by Polarized Light Microscopy, EPA Method 600/M4-82-020, Dec. 1982.

LEGEND:

NAD = no asbestos detected



19-07-02389

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Due Date:

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7469 Whitepine Rd Richmond, VA 23237

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7469 Whitepine Rd Richmond, VA 23237

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DOCUMENT 003143 - PERMIT APPLICATION

1.1 PERMIT APPLICATION INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. This Document and its attachments are not part of the Contract Documents.
- B. Permit Application: The building permit for Project has been applied for by Owner. A copy of the Permit Application is available for viewing.

END OF DOCUMENT 003143

DOCUMENT 004113 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1	BID INFORMATION			
A.	Bidder:			
В.	Project Name: Bank Lofts – Upper Story Housing Pilot Project.			
C.	Project Location: 302 Broadway; Audubon, Iowa.			
D.	Owner: Strong America Development Group, LLC.			
E.	Architect: The Franks Design Group, PC.			
F.	Architect Project Number: 190101.			
1.2	CERTIFICATIONS AND BASE BID			
A.	Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by The Franks Design Group, PC. and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:			
	1. Dollars (\$). 2. The above amount may be modified by amounts indicated by the Bidder on the attached Document 004323 "Alternates Form."			
1.3	BID GUARANTEE			
A.	The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety a specified within 10 days after a written Notice of Award, if offered within 30 days after receipt of bids, and o failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money orde or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:			
	1 Dollars (\$).			
В.	In the event Owner does not offer Notice of Award within the time limits stated above, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.			
1.4	TIME OF COMPLETION			
A.	The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents on a date specified in a written Notice to Proceed to be issued by Architect, and shall fully complete the Work within 180 calendar days.			

A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid: Addendum No. 1, dated ______. 1. 2. Addendum No. 2, dated ______. Addendum No. 3, dated _____. Addendum No. 4, dated _____. 3. 4. 1.6 **BID SUPPLEMENTS** The following supplements are a part of this Bid Form and are attached hereto. Α. 1. Bid Form Supplement - Alternates. 2. Bid Form Supplement - Allowances. Bid Form Supplement - Bid Bond Form (AIA Document A310-2010). 3. 1.7 CONTRACTOR'S LICENSE A. The undersigned further states that it is a duly licensed contractor, for the type of work proposed, in The State of lowa, and that all fees, permits, etc., pursuant to submitting this proposal have been paid in full. 1.8 SUBMISSION OF BID Respectfully submitted this _____ day of ______, 2020. A. В. Submitted By: ______(Name of bidding firm or corporation). C. Authorized Signature: (Handwritten signature). Signed By: ______(Type or print name). D. Title: _____ (Owner/Partner/President/Vice President). E. Witnessed By:_____(Handwritten signature). F. Attest:_____(Handwritten signature). G. H. By: (Type or print name). Title: (Corporate Secretary or Assistant Secretary). I. Street Address:_______. J. K. City, State, Zip: L. M. License No.: Federal ID No.:______(Affix Corporate Seal Here). N.

END OF DOCUMENT 004113

1.5

ACKNOWLEDGMENT OF ADDENDA

DOCUMENT 004313 - BID SECURITY FORMS

1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form.

1.2 BID BOND FORM

- A. AIA Document A312-2010 "Bid Bond" is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.
- B. Copies of AIA standard forms may be obtained from The American Institute of Architects; https://www.aiacontracts.org/; email: docspurchases@aia.org; (800) 942-7732.

END OF DOCUMENT 004313

DOCUMENT 004321 - ALLOWANCE FORM

1.1 BID INFORMATION

- A. Bidder: _____.
- B. Project Name: Bank Lofts Upper Story Housing Pilot Project.
- C. Project Location: 302 Broadway; Audubon, Iowa.
- D. Owner: Strong America Development Group, LLC.
- E. Architect: The Franks Design Group, PC.
- F. Architect Project Number: 190101.

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.
- B. The undersigned Bidder certifies that Base Bid submission to which this Bid Supplement is attached includes those allowances described in the Contract Documents and scheduled in Section 012100 "Allowances."

(DOCUMENT CONTINUES – SUBMISSION OF BID SUPPLEMENT, NEXT PAGE)

1.3 SUBMISSION OF BID SUPPLEMENT

ALLOWANCE	DESCRIPTION	ALLOWANCE AMOUNT
ALLOWANCE #1	Lump sum allowance to furnish and install manufactured "Murphy Bed" in Apartment #203.	
ALLOWANCE #2	Lump sum allowance to furnish and install all manufactured residential appliances in apartments #201, #202, and #203. This includes (3) ranges, (3) refrigerator/freezers, (3) microwave ovens, and (3) stackable washer/dryer sets.	

A.	Respectfully submitted this day of	, 2020.
B.	Submitted By:	(Insert name of bidding firm or corporation).
C.	Authorized Signature:	(Handwritten signature).
D.	Signed By:	(Type or print name).
E.	Title:	(Owner/Partner/President/Vice President).

END OF DOCUMENT 004321

DOCUMENT 004323 - ALTERNATES FORM

1.1	BID INFORMATION					
A.	Bidder:					
В.	Prime Contract:					
C.	Project Name: Bank Lofts – Upper Story Housing Pilot Project.					
D.	Project Location: 302 Broadway; Audubon, Iowa.					
E.	Owner: Strong America Development Group, LLC.					
F.	Architect: The Franks Design Group, PC.					
G.	Architect Project Number: 190101.					
1.2	BID FORM SUPPLEMENT					
A.	This form is required to be attached to the Bid Form.					
1.3	DESCRIPTION					
A.	The undersigned Bidder proposes the amount below be added to or deducted from the Base Bid if particular alternates are accepted by Owner. Amounts listed for each alternate include costs of related coordination, modification, or adjustment.					
	1. Cost-Plus-Fee Contract: Alternate price given below includes adjustment to Contractor's Fee.					
В.	If the alternate does not affect the Contract Sum, the Bidder shall indicate "NO CHANGE."					
C.	If the alternate does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."					
D.	The Bidder shall be responsible for determining from the Contract Documents the affects of each alternate on the Contract Time and the Contract Sum.					
E.	Owner reserves the right to accept or reject any alternate, in any order, and to award or amend the Contract accordingly within [60] days of the Notice of Award unless otherwise indicated in the Contract Documents.					
F.	Acceptance or non-acceptance of any alternates by the Owner shall have no affect on the Contract Time unless the "Schedule of Alternates" Article below provides a formatted space for the adjustment of the Contract Time.					
1.4	SCHEDULE OF ALTERNATES					
A.	Alternate No. 1 (reserved):					
	1. ADD DEDUCT NO CHANGE NOT APPLICABLE					

	2.		Dollars (\$).			
	3.	ADD DEDUCT	calendar days to adjust the Contract Time for this alternate.			
В.	Alter	nate No. 2 (reserved):				
	1.	ADD DEDUCT	NO CHANGE NOT APPLICABLE			
	2.		Dollars (\$).			
	3.	ADD DEDUCT	calendar days to adjust the Contract Time for this alternate.			
C.	Alter	nate No. 3 (reserved):				
	1.	ADD DEDUCT	NO CHANGE NOT APPLICABLE			
	2.		Dollars (\$).			
	3.	ADDDEDUCT	calendar days to adjust the Contract Time for this alternate.			
1.5	SUB	MISSION OF BID SUPPL	EMENT			
A.	Resp	Respectfully submitted this day of, 2020.				
В.	Submitted By:(Name of bidding firm or corporati					
C.	Authorized Signature:(Handwritten signature).					
D.	Sign	ed By:	(Type or print name).			
E.	Title:		(Owner/Partner/President/Vice President).			

END OF DOCUMENT 004323

PART 1 - GENERAL

The Supplementary Conditions amend and modify the General Conditions described previously in these specifications. Where at variance with General Conditions, these Supplementary Conditions shall have preference. Where any Article of the General Conditions is modified, deleted by these Supplementary Conditions, the unaltered provisions, whether a portion of the Article, paragraph, subparagraph, or clause shall remain in effect.

PART 2 - MODIFICATIONS

Definitions: Article 1.1 "Basic Definitions" of the General Conditions shall be and is supplemented as follows:

- 1. Add new Subparagraphs:
 - a. 1.1.9 The Agreement.

The agreement which the successful bidder will be required to sign is AIA Document A101 Standard Form of Agreement Between Owner and Contractor where the basis of payment is a stipulated sum. 2017 edition articles 1 through 9 inclusive, a standard form of the American Institute of Architects.

- 1.1.10 Furnish, Install or Provide.
 Unless specifically limited in the context, the word "Furnish" or the word "Install" or the word "Provide" or any combination thereof, shall mean furnish and incorporate in the Work including all necessary labor, materials, equipment, and everything necessary to perform the work indicated
- B. Copies Furnished and Ownership: Article 1.5 "Ownership & Use of Architect's Drawings" of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new Subparagraph 1.5.3:
 - a. 1.5.3 All Drawings and photographs of Drawings including those used for publicity purposes are instruments of service, the property of The Franks Design Group, P.C., Glenwood, lowa and may not be reproduced without their permission. The reproduction shall carry their name as Architect.
- C. Copies of Drawings and Project Manuals: Article 2.2.5 of the General Conditions shall be and is hereby modified as follows:
 - 1. Modify subparagraph as follows:
 - 2.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, up to ten (10) copies of Drawings and Project Manuals for execution of the Work.
- D. Site Layout: Article 3.3 "Supervision and Construction Procedures of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new Subparagraph 3.3.4:
 - a. 3.3.4 The Contractor shall be responsible for the correct layout to line, level and dimension of all work as shown on the Drawings. He shall notify the Architect of any discrepancy that may exist between site conditions and the Drawings and shall obtain written instructions from the Architect before proceeding with this work.
- E. Warranty: Article 3.5 "Warranty" of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new Subparagraph 3.5.3:
 - 3.5.3 The Prime Contractor shall, in case of work performed by his subcontractors and where guarantees are required, secure warranties from said subcontractors and deliver copies of same to the Architect upon completion of the work.

- F. Taxes: Article 3.6
 - 1. No modification (reserved).
- G. Permits: Article 3.7 "Permits, Fees and Notices," subparagraph 3.7.1 of the General Condition shall be and is hereby supplemented as follows:
 - 1. The Contractor shall obtain and pay for all other required permits and fees as described in paragraphs 3.7.1 through 3.7.4.
- H. Schedule: Article 3.10.1 of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new subparagraph 3.10.1.1:
 - a. 3.10.1.1 The Contractor shall review the construction schedule and progress of the work at least weekly and shall update the schedule at least monthly. Schedules shall be available for the Owner's and Architect's review at all times.
- I. "As-built" Drawings: Article 3.11 "Documents and Samples at the Site" of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new subparagraph 3.11.1:
 - a. 3.11.1 The Contractor shall maintain at their home office a second set of the as-built drawings. These drawings shall be kept up to date and be equal to the drawings required at the job site.
- J. Cleaning Up: Article 3.15 "Cleaning Up" of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new subparagraph 3.15.3:
 - 3.15.3 Special Cleaning: Besides the general floor cleaning, the Prime (General) Contractor shall do the following special cleaning for all trades at completion of Work:
 - (1) Cleaning of all fixtures and equipment furnished under these Specifications: All fixtures and equipment shall be cleaned of all stains, paint, dirt and rust.
 - (2) Cleaning of all windows and glass surfaces, both interior and exterior, and all other items having dust, dirt or other foreign material on them.
- K. Progress and Completion: Article 8.2
 - 1. Add new subparagraph 8.2.4:
 - a. 8.2.4 The Work shall be completed within the time limits stated in the Contract Documents. Liquidated Damages in the amount of \$200.00 per day shall be assessed to the contractor for each calendar day that the Work proceeds on the project beyond the specified completion date(s), excepting authorized extension thereof.
- L. Progress Payments: Article 9.3 "Applications for Payment" of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add the following to paragraph 9.3.1:
 - In applying for payments, the Prime Contractor shall submit three copies of a statement to the Architect showing the value of his material and labor satisfactorily incorporated in the building and acceptable material or equipment suitably stored at the site. Originals of the current editions of AIA Documents No. G702 and G703 shall be used for the applications for payment.
 - 2. Add the following to paragraph 9.3.2:
 - a. Materials stored off-site shall be included in the Application for Payment only if accompanied by substantial documentation.
 - 3. Add new Subparagraphs 9.3.4, 9.3.5 and 9.3.6:
 - a. 9.3.4 Five percent (5%) of the value of the work in place and materials suitably stored on the site, will be retained from each progress payment. The total sum retained shall be paid to the Contractor upon final completion of the Work as called for in Subparagraphs 9.9.1 and 9.9.2.

- b. 9.3.5 Before the first application for payment is approved, the Prime Contractor shall have submitted an acceptable progress schedule.
- c. 9.3.6 An updated construction schedule indicating current progress in the work and proposed scheduling for completing the Work by the completion date shall be submitted with each monthly application for payment.
- M. Payments: Article 9.10 "Final Completion & Final Payment" of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new Subparagraph 9.10.6:
 - a. 9.10.6 The following additional documents shall be furnished to the Owner prior to the final payment becoming due:
 - (1) Signed letter setting date of completion of specific guarantees.
 - (2) Guarantee Certificates for construction materials, etc., for periods specified in appropriate sections of these Specifications.
 - (3) Operating Manuals, Parts Lists and Equipment Drawings.
 - (4) All other items indicated in Section 017700, Closeout Procedures.
- N. Safety: Article 10 "Protection of Persons and Property of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new subparagraphs 10.1.1:
 - a. 10.1.1 The Contractor shall have sole responsibility for safety of persons and property, and for compliance with OSHA and/or other governing parties.
- O. Insurance: Article 11 "Insurance and Bonds" of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new subparagraph 11.1.2.1:
 - a. 11.1.2.1 The Contractor's liability insurance shall provide coverage for not less than the following amounts or greater where required by law.
 - (1) Workers' Compensation
 - State: Statutory
 - Employer's Liability: \$500,000
 - (2) Comprehensive General Liability:
 - Bodily Injury, Property Damage, Contractual Liability (Hold Harmless Coverage) and Personal Injury, with employment exclusion deleted:
 Combined single limit of \$1,000,000 per occurrence and \$2,000,000 general and products aggregate
 - Products and completed operations insurance shall be maintained for a minimum period of 2 years after final payment and Contractor shall continue to provide evidence of such coverage to Owner on an annual basis during the aforementioned period.
 - Property Damage Liability Insurance shall include coverage for explosion, collapse and underground hazard.
 - (3) Comprehensive Automobile Liability:
 - Bodily Injury and Property Damage: Combined single limit of \$1,000,000
 - (4) Other Insurance:
 - Excess Liability Umbrella \$1,000,000
 - (5) All policies required under this project shall name the Owner, and The Franks Design Group, P. C. as "Additional Insureds."
 - (6) Property Insurance: The contractor shall purchase and maintain property insurance including "all risk" coverage as called out in paragraph 11.3.1 of the General Conditions, AIA Document A201. The Contractor will be responsible for payment of any deductibles.
 - (7) Certificates of Each Contractor's Liability Insurance shall be filed with the General Contractor.

- P. Guarantee: Article 12.2 "Correction of Work" of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add the following to paragraph 12.2.2.1:
 - a. The Prime Contractor shall and does hereby guarantee the following in respect to all work performed by his or her subcontractors.
 - (1) For a period of one year from the date of substantial completion and longer if so written in any of the sections, all movable or adjustable work shall remain in perfect working order, including hardware, weatherstripping, doors, apparatus, and all other equipment to which this heading is applicable.
 - (2) Nothing in the above intends or implies that this guaranty shall apply to work which has been abused or neglected by the Owner or his successor in interest.
 - (3) Where guarantees or warranties are written in any of the Sections for longer terms, such longer terms shall apply.
- Q. Payment to Unemployment Compensation Fund:

Article 13: Miscellaneous provisions shall be and is herein supplemented as follows:

- 1. Add new paragraph 13.6:
 - a. 13.6 Payment to Unemployment Compensation Fund: The Contractor will pay to the Unemployment Compensation Fund of the State in which the project is located Unemployment Contributions and interest due on wages paid to individuals employed in the performance of this contract
- R. Construction Meetings: Article 13 "Miscellaneous Provisions" of the General Conditions shall be and is hereby supplemented as follows:
 - 1. Add new paragraph 13.7:
 - a. 13.7 Construction Meetings: The Contractor shall arrange the following minimum number of meetings with subcontractors, suppliers and others as needed to coordinate and construct the work in a timely and sufficient manner.
 - (1) Preconstruction Meeting: Before the start of construction on the project this meeting shall be held to discuss procedural and other items relative to start of work. The Contractor and at least all major subcontractors shall attend. The Architect will conduct this meeting.
 - (2) Construction Meetings: The Contractor shall conduct regular construction progress meetings, with the frequency of such meetings adjusted to reflect the level of active and anticipated construction activity, throughout the entire contract time for construction. A representative from each company working on the project, or about to do work, and one that has authority to make decisions for the company shall attend these meetings. The Owner's representative and Architect shall have the right to attend any, or all, of these meetings.

END OF SECTION 007300

SECTION 011000 - SUMMARY

1.1 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased construction.
 - 4. Work under Owner's separate contracts.
 - 5. Contractor's use of site and premises.
 - 6. Coordination with occupants.
 - 7. Work restrictions.
 - 8. Specification and Drawing conventions.
- B. Related Requirements:
 - Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

- A. Project Identification: Bank Lofts Upper Story Housing Pilot Project.
 - 1. Project Location: 302 Broadway; Audubon, Iowa.
- B. Owner: Strong America Development Group, LLC.
 - 1. Owner's Representative: Matthew Campbell.
- C. Architect: The Franks Design Group, PC.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. Scope of work includes selective demolition while protecting existing historic elements, Installation of new HVAC systems, Installation of new Electrical systems, Installation of new plumbing systems, Installation of a new interior stair with associated structural work, repair and restoration of existing historic windows, Installation of new Storm Windows, Masonry repair and restoration where indicated, Installation of complete new roof system with thermal insulation, installation of kitchens and bathrooms for three (3) proposed upper story apartments, Installation of new guardrails at entry area stoops, and other work as indicated in the Documents.
 - 2. The Work includes historic buildings being reviewed under Section 106 NHPA and HUD regulations for NEPA (24 CFR Part 58.5[b]). The Work will follow historic guidelines established by the Secretary of the Interior and Standards for the Treatment of Historic Properties.
 - The Project to which the construction work covered by this contract pertains is being assisted by the United States of America and Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance. Related Required Contract Provisions are included, or referenced, in this Project Manual.
 - 4. Work of this Contract is <u>not</u> subject to compliance with The Davis-Bacon and Related Acts.

- B. Type of Contract:
 - 1. Project will be constructed under a single prime contract.

1.4 PHASED CONSTRUCTION

- A. The Work shall be conducted in phases, with each phase substantially complete as indicated.
 - Coordinated multiple prime contract Phase One: Coordinated abatement of ACM-containing materials (under separate prime contract) in the existing roofing system. General Contractor to work with Owner's abatement contractor to complete roof tear-off and provide temporary enclosure until new roof system can be made watertight.
 - a. Commencement of Construction:
 - 1) Start Date: Work of this phase shall commence by TBD.
 - b. Substantial Completion:
 - 1) By TBD.
 - 2. Coordinated multiple prime contract Phase Two: Coordinated abatement of ACM-containing materials (under separate prime contract) in the existing historic windows to be restored. General Contractor to work with Owner's abatement contractor to complete sash removal, on-site storage in the existing building, abatement of ACM materials in window sashes, safe handling and on-site storage of sashes and unbroken glass in the existing building, and historic window restoration as specified in Section 080352 Historic Treatment of Wood Windows after the ACM-containing materials have been abated.
 - a. Commencement of Construction:
 - 1) Start Date: Work of this phase shall commence by TBD.
 - b. Substantial Completion:
 - 1) By TBD.
- B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates for all phases of the Work.

1.5 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
 - 1. ACM Abatement: to separate contractor to be determined for Abatement of all ACM materials to-be-abated. See coordinated phase explanations, above for Work, by General Contractor to be coordinated with ACM Abatement Contractor that requires sequence, schedule, and logistical cooperation.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Unrestricted Use of Site: 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.
- B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
- 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.

1.7 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner's Tenant will occupy the main level front tenant space during entire construction period. Cooperate with Owner's tenant during construction operations to minimize conflicts and facilitate tenant usage. Perform the Work so as not to interfere with Tenant's operations. Maintain existing exits unless otherwise indicated.

1.8 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: Unlimited except if activities will violate local Noise Ordinances, if any.
- 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 providing temporary utility services according to requirements indicated:
 - 1. Notify Owner and Owner's tenant not less than two days in advance of proposed 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 Owner and Owner's tenant not less than two days in advance of proposed disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances within the existing building and on Owner's property is not permitted.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. 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.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include one or more of the following:
 - 1. Lump-sum allowances.
 - 2. Quantity allowances.
 - 3. Contingency allowances.

1.2 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.3 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

1.4 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

- C. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
 - 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- D. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
 - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Lump-Sum Allowance: Include the sum of \$2,500.00 for furnish and install manufactured "Murphy Bed" in Apartment #203.
 - 1. This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and profit.
- B. Allowance No. 2: Lump-Sum Allowance: Include the sum of \$15,000.00 to furnish and install all manufactured residential appliances in apartments #201, #202, and #203. This includes (3) ranges, (3) refrigerator/freezers, (3) microwave ovens, and (3) stackable washer/dryer sets.

This allowance includes material, receiving, handling, and installation costs, and Contractor overhead and 1. profit. END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
- C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 -	PRODUCTS	(Not Used)
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PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 (reserved):
 - 1. Base Bid:
 - 2. Alternate:
 - 3. ADD DEDUCT NO CHANGE NOT APPLICABLE .

	4.					Dollars (\$).
	5.	ADD	DEDUCT	calendar days t	o adjust the Contract Tir	ne for this alternate.	
В.	Alterr	nate No. 2	(reserved):				
	1.	Base Bi	d:				
	2.	Alternat	e:				
	3.	ADD	DEDUCT	NO CHANGE	NOT APPLICABLE	·	
	4.					Dollars (\$).
C.	Alterr	nate No. 3	(reserved):				
	1.	Base Bi	d:				
	2.	Alternat	e:				
	3.	ADD	DEDUCT	NO CHANGE	NOT APPLICABLE	·	
	4.					Dollars (\$).
	5.	ADD	DEDUCT	calendar days t	o adjust the Contract Tir	ne for this alternate.	

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - Document 002600 "Procurement Substitution Procedures" for requirements for substitution requests prior to award of Contract.
 - 2. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 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 in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Reguest 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.
- I. 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 seven days of receipt of a request for substitution. Architect will notify Contractor 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.

1.4 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.

1.5 PROCEDURES

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

1.6 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 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 of Award. 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 offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.
 - j. 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 012500

(CONTRACTOR'S SUBSTITUTION REQUEST - FORM 012500A - FOLLOWS)

BANK LOFTS UPPER STORY HOUSING PROJECT CONTRACTOR'S SUBSTITUTION REQUEST

FORM 012500A - FOR USE AFTER THE BIDDING/NEGOTIATION PHASE

(Use separate form for each request.)

Date:		Request No	
T0:	The Franks Design Group, PC 410 1st Street Glenwood, Iowa 51534 Phone: (712) 527-3996		
ATTN	:		
CONT	TRACTOR:		
SPEC	CIFIED ITEM:		
Spec	ification Section:	Specification Section Page:	
Spec	ification Article/Paragrah:	Drawing/Detail Number(s):	
The u	ındersigned requests consideration of the fol	lowing,	
PR0F	POSED SUBSTITUTION (include trade name a	and model # of proposed substitution and ma	nufacturer's contact information:
REAS		ED ITEMS:	
•	CHANGE in CONTRACT PRICE for ACCEPTIN	IG SUBSTITUTE: \$	
•	CHANGE in CONTRACT TIME for ACCEPTING	S SUBSTITUTE:	Days

Attached data includes description, specifications, drawings, photographs, performance and test data adequate for evaluation of request; applicable portions of data are clearly identified.

Attached data also includes a description of changes to Contract Documents that proposed substitution will require for its proper installation.

The undersigned certifies that the following paragraphs, unless modified by attachments, are correct:

- 1. Proposed Substitution has checked and coordinated with Contract Documents, and has been fully investigated and determined to be equal or superior in all respecs to specified product
- 2. Proposed Substitution does not affect dimensions shown on Drawings.
- 3. Proposed Substitution does not require revisions to mechanical or electrical work.

- 4. The undersigned will pay for changes to building design, including Architectural and Engineering design, detailing, and construction costs caused by requested Substitution.
- 5. Proposed Substitution will have no adverse affect on other trades, construction schedule, or specified warranty requirements.
- 6. Maintenance and service parts will be locally available for proposed substitution.

The undersigned further states that the function, appearance, and quality of proposed Substitution are equivalent or superior to specified item.

Attachments: The attached data is furnished herewith for evaluation of the proposed substitution.

[] Catalog [] Drawings [] Samples [] Reports [] Tests [] Other

[] Catalog [] Dra	wings [] Samples [] f	Reports [] Tests [] (Other	
Submitted by:				
			BY:	
(Contractor)			(Authorized legal signature)	
(Address)				
Telephone: ()			
For use by the Arch	itect:			
[] Approved	[] Approved as noted	[] Not Approved	[] Received too late for consideration	
Remarks:				
Signed			Date	

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

SUMMARY 1.1

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.

1.3 PROPOSAL REQUESTS

- Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that Α. 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.
 - Include a list of quantities of products required or eliminated and unit costs, with total amount of a. purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts. b.
 - C. Include costs of labor and supervision directly attributable to the change.
 - 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.
- В. 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.
 - Include costs of labor and supervision directly attributable to the change. 4.
 - 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.

190101

6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 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.

1.5 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 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 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.
- 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. Arrange schedule of values consistent with format of AIA Document G703.
 - 2. 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.
 - 3. 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.
 - 4. 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.
 - 5. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
 - 6. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.3 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.

- 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.
- E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. 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.
 - 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.
- G. 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. Products list (preliminary if not final).
 - 5. Sustainable design action plans, including preliminary project materials cost data.
 - 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.
- H. 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.
- 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. 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. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 3. Updated final statement, accounting for final changes to the Contract Sum.
 - 4. AIA Document G706.
 - 5. AIA Document G706A.
 - 6. AIA Document G707.
 - 7. Evidence that claims have been settled.
 - 8. 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.
 - 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 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.
 - RFIs.
 - 4. Digital project management procedures.
 - 5. Project meetings.

B. Related Requirements:

- 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
- 2. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.2 INFORMATIONAL 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.

1.3 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. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.

- 2. Preparation of the schedule of values.
- 3. Installation and removal of temporary facilities and controls.
- 4. Delivery and processing of submittals.
- 5. Progress meetings.
- 6. Preinstallation conferences.
- 7. Project closeout activities.
- 8. Startup and adjustment of systems.

1.4 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.
 - 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 so as 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:
 - Owner name.
 - 2. Owner's Project number.
 - 3. Name of Architect].
 - 4. Architect's Project number.
 - 5. Date.
 - 6. Name of Contractor.
 - 7. RFI number, numbered sequentially.
 - 8. RFI subject.
 - 9. Specification Section number and title and related paragraphs, as appropriate.
 - 10. Drawing number and detail references, as appropriate.
 - 11. Field dimensions and conditions, as appropriate.
 - 12. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 13. Contractor's signature.
 - 14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven 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 Architect of 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 012600 "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 five 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 bi-weekly. Software log with not less than 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.
- 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 seven days if Contractor disagrees with response.

1.5 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's plan background CAD drawings will be provided by Architect for Contractor's use during construction.
 - 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
 - 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 - 3. Digital Drawing Software Program: Contract Drawings are available in Autocad LT 2013 version.
 - 4. Contractor shall execute a data licensing agreement in the form of AIA Document C106 Digital Data Licensing Agreement.
- B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
- B. Preconstruction Conference: Architect 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 Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference.

190101

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.
 - I. Submittal procedures.
 - m. Sustainable design requirements.
 - n. Preparation of Record Documents.
 - o. Use of the premises and existing building.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for moisture and mold control.
 - u. Procedures for disruptions and shutdowns.
 - v. Construction waste management and recycling.
 - w. Parking availability.
 - x. Office, work, and storage areas.
 - y. Equipment deliveries and priorities.
 - z. First aid.
 - aa. Security.
 - bb. 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 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. Sustainable design requirements.
 - i. Review of mockups.
 - j. Possible conflicts.

013100 - 4

- k. Compatibility requirements.
- Time schedules.
- m. Weather limitations.
- n. Manufacturer's written instructions.
- o. Warranty requirements.
- p. Compatibility of materials.
- g. Acceptability of substrates.
- r. Temporary facilities and controls.
- s. Space and access limitations.
- t. Regulations of authorities having jurisdiction.
- u. Testing and inspecting requirements.
- v. Installation procedures.
- w. Coordination with other work.
- x. Required performance results.
- y. Protection of adjacent work.
- z. 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. Progress Meetings: Conduct progress meetings at regular intervals.
 - 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to representatives of Owner 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 meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - 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) Status of submittals.
 - 4) Status of sustainable design documentation.
 - 5) Deliveries.
 - 6) Off-site fabrication.
 - 7) Access.
 - 8) Site use.
 - 9) Temporary facilities and controls.
 - 10) Progress cleaning.

- 11) Quality and work standards.
- 12) Status of correction of deficient items.
- 13) Field observations.
- 14) Status of RFIs.
- 15) Status of Proposal Requests.
- 16) Pending changes.
- 17) Status of Change Orders.
- 18) Pending claims and disputes.
- 19) 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Submittal schedule requirements.
- 2. Administrative and procedural requirements for submittals.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's [and Construction Manager'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[and Construction Manager'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."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list 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 Construction Manager] and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 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. Options: Identify options requiring selection by Architect.
- C. 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[and Construction Manager] on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Paper Submittals:

- 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] < Insert dimensions > on label or beside title block to record Contractor's review and approval markings and action taken by Architect[and Construction Manager].
- 3. Action Submittals: Submit [three] < Insert number > paper copies of each submittal unless otherwise indicated. Architect[, through Construction Manager,] will return [two] < Insert number > copies.
- 4. Informational Submittals: Submit [two] < Insert number > paper copies of each submittal unless otherwise indicated. Architect[and Construction Manager] will not return copies.
- 5. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using [AIA Document G810] [facsimile of sample form included in Project Manual] transmittal form.
- E. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file.

 Name PDF file with submittal number.
- F. Submittals for Utilizing Web-Based Project Management Software: Prepare submittals as PDF files, or other format indicated by Project management software.

1.5 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.
 - 2. Paper: Prepare submittals in paper form, and deliver to Architect.
- 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.
- 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. 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. Resubmittal Review: Allow 15 days for review of each resubmittal.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- 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 and Construction Manager's action stamp.

1.6 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. Standard color charts.
 - 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 concurrent 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 unless submittal based on Architect's digital data drawing files is otherwise permitted.
 - 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.
- 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.
 - a. Two opaque (bond) copies of each submittal. Architect will return one copy(ies).
- C. Samples: Submit Samples for review of kind, 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. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
 - 5. 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 not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 6. 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.
 - 7. 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:
- 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 Welding Procedure Specification and Procedure Qualification Record 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.

1.7 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 a uniform 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.

1.8 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return it.
 - 1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action, as indicated on the submittal transmittal sheet included in the Project Manual.
 - 2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as indicated on the submittal transmittal sheet included in the Project Manual.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

(Submittal transmittal form follows)

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FDG		Bank Lofts CT # 1901 DR:	01													
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NOT	ICE TO (CONTRACT	ORS:	If any submittal deviates from the Contract Documents, the Contractor shall advise the Architect of the deviations in writing accompanying the submittal, including the reasons for the deviations.												
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Bank Lofts 190101

SECTION 013516 - AI TERATION PROJECT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes special procedures for alteration work.

1.2 **DFFINITIONS**

- A. Alteration Work: This term includes remodeling, renovation, repair, and maintenance work performed within existing spaces or on existing surfaces as part of the Project.
- В. Consolidate: To strengthen loose or deteriorated materials in place.
- C. Design Reference Sample: A sample that represents the Architect's prebid selection of work to be matched; it may be existing work or work specially produced for the Project.
- D. 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.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Repair: To correct damage and defects, retaining existing materials, features, and finishes. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.
- Н. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- I. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as J. the original, unless otherwise indicated.
- K. Retain: To keep existing items that are not to be removed or dismantled.
- Strip: To remove existing finish down to base material unless otherwise indicated. L.

1.3 PROJECT MEETINGS FOR ALTERATION WORK

- Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site. A.
 - Attendees: In addition to representatives of Owner, Architect, and Contractor, testing service representative, and 1. chemical-cleaner manufacturer(s) shall be represented at the meeting.
 - 2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:

- a. Fire-prevention plan.
- h. Governing regulations.
- Areas where existing construction is to remain and the required protection. C.
- d. Hauling routes.
- Sequence of alteration work operations. e.
- Storage, protection, and accounting for salvaged and specially fabricated items. f.
- Existing conditions, staging, and structural loading limitations of areas where materials are stored. a.
- 3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.
- В. Coordination Meetings: Conduct coordination meetings specifically for alteration work at regular intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
 - 1. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
 - 2. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.4 MATERIALS OWNERSHIP

A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plagues and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.

1.5 INFORMATIONAL SUBMITTALS

- A. Alteration Work Program: Submit 30 days before work begins.
- В. Fire-Prevention Plan: Submit 30 days before work begins.

1.6 QUALITY ASSURANCE

- Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" A. according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.
- B. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.
 - Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means 1. of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
 - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- C. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan

with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.

D. Safety and Health Standard: Comply with ANSI/ASSE A10.6.

1.7 STORAGE AND HANDLING OF SALVAGED MATERIALS

A. Salvaged Materials:

- 1. Clean loose dirt and debris from salvaged items unless more extensive cleaning is indicated.
- Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
- Store items in a secure area until delivery to Owner. 3.
- Transport items to Owner's storage area on-site. 4.
- Protect items from damage during transport and storage.

B. Salvaged Materials for Reinstallation:

- Repair and clean items for reuse as indicated. 1.
- Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of 2. 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 unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after alteration and other construction work in the vicinity is complete.
- D. Storage: Catalog and store items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
 - 1. Identify each item for reinstallation with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 - 2. Secure stored materials to protect from theft.
 - 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F (3 deg C) or more above the dew point.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
 - 1. Use only proven protection methods, appropriate to each area and surface being protected.

- 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
- Erect temporary barriers to form and maintain fire-egress routes. 3.
- Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit 4. that must remain in service during alteration work.
- 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
- 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
- Protect floors and other surfaces along hauling routes from damage, wear, and staining. 7.
- B. Temporary Protection of Materials to Remain:
 - Protect existing materials with temporary protections and construction. Do not remove existing materials unless 1. otherwise indicated.
 - 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
 - 1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
 - 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration
 - 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
 - 1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration
 - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.2 PROTECTION FROM FIRE

- Α. General: Follow fire-prevention plan and the following:
 - 1. Comply with NFPA 241 requirements unless otherwise indicated.
 - Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary 2. for the immediate work.
 - If combustible material cannot be removed, provide fire blankets to cover such materials.
- Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work В. with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
 - As far as practicable, restrict heat-generating equipment to shop areas or outside the building. 1.

- 2. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe
- 3. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
- 4. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
- 5. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
 - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
 - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
 - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
 - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.

3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.
- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

3.4 GENERAL ALTERATION WORK

- A. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- B. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
 - 1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 013516

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 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. 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.
 - 2. 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.

1.2 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five 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 Subsubcontractor, 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: Full-size physical assemblies that are constructed on-site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
 - 2. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- 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; for example, plant, mill, factory, or shop.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall have the same meaning as 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.

1.3 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 shall be 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- B. 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.
- C. 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.

1.5 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. Statement on condition of substrates and their acceptability for installation of product.
 - 2. Statement that products at Project site comply with requirements.
 - 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 5. 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. Statement that equipment complies with requirements.
 - 2. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 3. Other required items indicated in individual Specification Sections.

1.6 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. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- 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 according to 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. 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:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 2. 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.
- I. 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 that 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.
 - Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work

1.7 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, and the Contract Sum will be adjusted by Change Order.
- 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. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. 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, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect 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 Section 013300 "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:
 - 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. Preliminary design mix proposed for use for material mixes that require control by testing agency.
- 6. 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.

1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector 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 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 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 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 017300 "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.

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 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. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL 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. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- D. 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.

1.4 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.

1.5 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 TEMPORARY FACILITIES

- A. Field Offices: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. A portion of the existing main level will be available for use as a Common-Use Field Office. 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 8 individuals.
 - 3. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
 - 4. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.2 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] < Insert number > at each return-air grille in system and remove at end of construction[.][and clean HVAC system as required in Section 017700 "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 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 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.
- 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.

3.3 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: Install water service and distribution piping in sizes and pressures adequate for construction.
- 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.
- E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- F. 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.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 - 1. Utilize designated area within existing building for temporary field offices.

- 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. Parking: Use available on street parking areas for construction personnel.
- C. Storage and Staging: Use existing sidewalk and street parking areas adjacent to Project site for storage and staging needs.
- D. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated in Project Manual 4' x 8' project identification sign with graphics as indicated.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - 3. Maintain and touch up signs so they are legible at all times.
- E. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- F. 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.
- G. 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.

3.5 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. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- C. 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.

- D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- E. 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.
- F. 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.
- G. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
- H. 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. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to 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.

3.6 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.

3.7 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. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. [Manufacturer's published attributes and characteristics of basis-of-design product also establish salient characteristics of products for purposes of evaluating comparable products.]
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

- 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
- 2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

1.5 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

- 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
- 4. Where products are accompanied by the term "as selected," Architect will make selection.
- 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

- 1. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
- 2. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
- 3. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
- 4. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.
- 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - For approval of products by unnamed manufacturers, comply with requirements in Section 012500
 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

- 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- E. Sustainable Product Selection: Where Specifications require product to meet sustainable product characteristics, select products complying with indicated requirements. Comply with requirements in Division 01 sustainability requirements Section and individual Specification Sections.
 - 1. Select products for which sustainable design documentation submittals are available from manufacturer.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 - 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 - 3. Evidence that proposed product provides specified warranty.
 - 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 - 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 013300 "Submittal Procedures."
 - 1. Form of Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
 - 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.
- D. Submittal Requirements, Single-Step Process: When acceptable to Architect, incorporate specified submittal requirements of individual Specification Section in combined submittal for comparable products. Approval by the Architect of Contractor's request for use of comparable product and of individual submittal requirements will also satisfy other submittal requirements.

PART 3 - EXECUTION (Not Used)

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. Coordination of Owner's portion of the Work.
 - 6. Coordination of Owner-installed products.
 - 7. Progress cleaning.
 - 8. Starting and adjusting.
 - 9. Protection of installed construction.

B. Related Requirements:

- 1. Section 011000 "Summary" for coordination of Owner-furnished products, Owner-performed work, Owner's separate contracts, and limits on use of Project site.
- 2. Section 017700 "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. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

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 QUALITY ASSURANCE

- A. 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.

- 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.
- 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.
- B. 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.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

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 local utility 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 in accordance with requirements in Section 013100 "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 existing conditions. If discrepancies are discovered, notify Architect promptly.

3.4 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] < Insert dimension > in occupied spaces and [90 inches] < Insert dimension > 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.
 - 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.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.5 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 Section 011000 "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 [minimize] [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.

3.6 COORDINATION OF OWNER'S PORTION OF THE WORK

A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.

- 1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.
- 2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed products
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

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.
 - 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 Construction Waste Management and Disposal."
- 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. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION AND REPAIR 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. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. 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.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for commencement of the Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in tons.
 - 4. Quantity of waste salvaged, both estimated and actual in tons.
 - 5. Quantity of waste recycled, both estimated and actual in tons.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

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- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.5 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - EXECUTION

2.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

- 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
- 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

2.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor as often as required to prevent overfilling bins.

2.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

- 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
- 2. Polystyrene Packaging: Separate and bag materials.
- 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
- 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

- 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
- 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 - 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

D. Paint: Seal containers and store by type.

2.4 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. General: Except for items or materials to be salvaged or recycled, remove waste materials and legally dispose of at designated spoil areas on Owner's property.
- C. Burning: Do not burn waste materials.
- D. Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

2.5 ATTACHMENTS

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 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. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
- 2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
- 3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 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.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

- A. 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.
- 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.
- 5. Submit testing, adjusting, and balancing records.
- 6. Submit sustainable design submittals not previously submitted.
- 7. 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. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 - 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 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.

1.5 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 Section 012900 "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.
- 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.

1.6 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, 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. PDF Electronic File: Architect will return annotated file.

1.7 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 or by email 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.
- E. Provide additional copies of each warranty to include in operation and maintenance manuals.

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.
 - 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. 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. 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.
 - c. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - d. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - e. Vacuum and mop concrete.
 - f. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - g. 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.
 - h. Remove labels that are not permanent.
 - i. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - j. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - k. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - I. 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 Section 230130.52 "Existing HVAC Air-Distribution System Cleaning."

- m. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
- n. Clean strainers.
- o. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 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.
- B. Related Requirements:
 - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints and one set(s) of file prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:
 - 1) Submit PDF electronic files of scanned Record Prints and three set(s) of file prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.

1.3 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.
 - I. 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.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - 1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 - 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

1.4 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 and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
 - 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.5 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)

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1.4 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. Hazardous materials will be removed by the Owner under a separate contract before start of the Work, except where coordination of General Construction and Hazardous materials abatement is necessary to maintain a continuous building envelope.
 - 2. If suspected hazardous materials, in addition to those identified in the survey and testing document, 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.
- G. Arrange selective demolition schedule so as not to interfere with Owner's operations.

1.5 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties.

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 ASSE 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. Perform a survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
- C. Inventory and record the condition of items to be removed and salvaged.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- 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. Arrange to shut off utilities with utility companies.
 - 2. 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. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.

- d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
- e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 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.
- 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.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION

- 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. 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.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. 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.
 - 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 5. Dispose of demolished items and materials promptly. Comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- 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.
 - Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area on-site 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. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 CLEANING

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
 - 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.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. 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.

SECTION 040322 - HISTORIC BRICK UNIT MASONRY REPAIR

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes historic treatment work consisting of repairing historic clay brick masonry.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

1.2 DEFINITIONS

- A. Low-Pressure Spray:
 - 1. Pressure: 100 to 400 psi.
 - 2. Flow Rate: 4 to 6 gpm.
- B. Rebuilding (Setting) Mortar: Mortar used to set and anchor masonry in a structure, distinct from pointing mortar installed after masonry is set in place.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to masonry historic treatment and repair.
 - 2. Review methods and procedures related to repairing historic brick masonry.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, and locations of masonry repair work on the structure.
 - 2. Show full-size patterns with complete dimensions for new molded brick shapes and brick arches and their jointing, showing relationship of existing units to new units.
 - 3. Show provisions for expansion joints or other sealant joints.
 - 4. Show replacement and repair anchors. Include details of anchors
- C. Samples: For each exposed product and for each color and texture specified.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction test reports.

1.6 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic brick masonry repair specialist. Experience installing standard unit masonry is insufficient experience for masonry historic treatment work.
 - 1. Historic Treatment Worker Qualifications: When bricks are being patched, assign at least one worker per crew who is trained and certified by manufacturer of patching compound to apply its products] < Insert requirement.
- B. Mockups: Prepare mockups of historic treatment to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.
 - Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than two adjacent whole units or approximately 48 inches in least dimension. Construct sample areas in locations in existing walls where directed by Architect unless otherwise indicated. Demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - a. Replacement: Four brick units replaced.
 - b. Patching: Three small holes at least 1 inch in diameter for each type of brick indicated to be patched, so as to leave no evidence of repair.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on brick masonry as follows:
 - 1. Replacement Brick: Test each proposed type of replacement brick, according to sampling and testing methods in ASTM C 67 for compressive strength, 24-hour cold-water absorption, five-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

- A. Face Brick: Units, including molded, ground, cut, or sawed shapes as required to complete masonry repair work.
 - 1. Brick Matching Existing: Units with colors, color variation within units, surface texture, size, and shape that match existing brickwork.
 - a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.
 - b. For Architect's sample that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range rather than brick that matches an individual color within that range.

2. Special Shapes:

- a. Provide molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position, and where shapes produced by sawing would result in sawed surfaces being exposed to view.
- b. Provide specially ground units, shaped to match patterns, for arches and where indicated.

- c. Mechanically chopping or breaking brick, or bonding pieces of brick together by adhesive, are unacceptable procedures for fabricating special shapes.
- B. Building Brick: ASTM C 62, Grade SW where in contact with earth, Grade SW, MW, or NW for concealed backup; of same vertical dimension as face brick, for masonry work concealed from view.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II; white or gray or both where required for color matching of mortar
 - 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Sand: ASTM C 144 unless otherwise indicated.
 - 1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 - 2. Colored Mortar: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
 - 3. For exposed mortar, provide sand with rounded edges.
- D. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
- E. Water: ASTM C 270, potable.

2.3 MANUFACTURED REPAIR MATERIALS

- A. Brick Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching brick masonry.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cathedral Stone Products, Inc.; Jahn M100 Terra Cotta and Brick Repair Mortar.
 - b. Conproco Corporation; Mimic.
 - c. Edison Coatings, Inc.; Custom System 45.
 - 2. Use formulation that is vapor and water permeable (equal to or more than the brick), exhibits low shrinkage, has lower modulus of elasticity than the bricks being repaired, and develops high bond strength to all types of masonry.
 - 3. Formulate patching compound used for patching brick in colors and textures to match each unit being patched. Provide sufficient number of colors to enable matching the color, texture, and variation of each unit.

2.4 ACCESSORY MATERIALS

A. Setting Buttons and Shims: Resilient plastic, nonstaining to masonry, sized to suit joint thicknesses and bed depths of bricks, less the required depth of pointing materials unless removed before pointing.

2.5 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight.

 Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
- B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 - 1. Repointing Mortar identified as Restoration Lime Putty: Pre-Blended Lime Putty consisting of one part hydraulic lime and 2.5 parts clean sharp sand color and appearance to match historic materials.
 - 2. Rebuilding (Setting) Mortar by Volume: ASTM C 270, Proportion Specification, 1 part portland cement, 6 parts lime, and 12 parts sand.
 - 3. Rebuilding (Setting) Mortar by Type: ASTM C 270, Proportion Specification, Type 0 unless otherwise indicated; with cementitious material limited to portland cement and lime.
 - 4. Colored Mortar: Add mortar pigments to produce exposed, setting (rebuilding) mortar of colors required.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Prevent mortar from staining face of surrounding masonry and other surfaces.
- B. Remove gutters and downspouts and associated hardware adjacent to immediate work area, and store during masonry repair work. Reinstall when repairs are complete.
 - 1. Provide temporary rain drainage during work to direct water away from building.

3.2 MASONRY REPAIR, GENERAL

A. Have repair work performed only by qualified historic treatment specialist.

3.3 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Support and protect remaining masonry that surrounds removal area.
- C. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

- D. Notify Architect of unforeseen detrimental conditions, including voids, cracks, bulges, loose masonry units in existing backup, rotted wood, rusted metal, and other deteriorated items.
- E. Remove in an undamaged condition as many whole bricks as possible. Remove mortar and sealant from surfaces of removed units.
- F. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for brick replacement.
- G. Replace removed damaged brick with other removed brick in good condition, where possible, matching existing brick. Do not use broken units unless they can be cut to usable size.
- H. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
 - 1. Maintain joint width for replacement units to match existing joints.
 - 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- I. Lay replacement brick with rebuilding (setting) mortar and with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min.. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
 - 2. When mortar is hard enough to support units, remove shims and other devices interfering with pointing of joints.
- J. Curing: Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - 1. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.

3.4 BACKUP MASONRY REMOVAL AND REPLACEMENT

- A. Where backup masonry is fractured or unstable and at locations indicated, remove mortar and masonry units that are broken or deteriorated and rebuild with whole, new brick or whole salvaged backup masonry units. Carefully remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
- B. Perform backup masonry removal and replacement according to requirements in "Brick Removal and Replacement" Article.

3.5 BRICK MASONRY PATCHING

- A. Patch the following bricks unless another type of repair or replacement is indicated:
 - 1. Units indicated to be patched.
 - 2. Units with holes.
 - 3. Units with chipped edges or corners. Patch chipped edges or corners measuring more than 3/4 inch in least dimension.

4. Units with small areas of deep deterioration. Patch deep deteriorations measuring more than 3/4 inch in least dimension and more than 1/4 inch deep.

B. Patching Bricks:

- 1. Remove loose material from masonry surface. Carefully remove additional material so patch does not have feathered edges but has square or slightly undercut edges on area to be patched and is at least 1/4 inch(es thick, but not less than recommended in writing by patching compound manufacturer.
- 2. Mask adjacent mortar joint or rake out for repointing if patch extends to edge of brick.
- 3. Mix patching compound in individual batches to match each unit being patched. Combine one or more colors of patching compound, as needed, to produce exact match.
- 4. Rinse surface to be patched and leave damp, but without standing water.
- 5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.
- 6. Place patching compound in layers as recommended in writing by patching compound manufacturer, but not less than 1/4 inch or more than 2 inches thick. Roughen surface of each layer to provide a key for next layer.
- 7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the brick. Shape and finish surface before or after curing, as determined by testing, to best match existing brick.
- 8. Keep each layer damp for 72 hours or until patching compound has set.

3.6 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.

FND OF SECTION 040322

SECTION 040323 - HISTORIC BRICK UNIT MASONRY REPOINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes historic treatment work consisting of repointing brick masonry joints.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

1.2 UNIT PRICES

A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.3 DEFINITIONS

- A. Masonry restoration work is to occur as indicated in the drawings.
 - 1. Drawing note "Incidental/Light" intensity indicates spot pointing: repairs at open joints, infill at removed anchors, etc. All masonry surfaces at façade unless otherwise noted.
 - 2. Drawing note "Moderate" Intensity indicates more widespread repairs. Intent is for approximately 40-50% of mortar joints to be ground and pointed. All masonry surfaces at façade unless otherwise noted.
 - 3. Drawing note "Intensive" treatment indicates full-surface repairs including replacement of fractured bricks visually discernable at the time of bidding. 100% of exterior mortar joints to be ground and pointed. All masonry surfaces at façade unless otherwise noted.
- B. Low-Pressure Spray:

1. Pressure: 100 to 400 psi.

2. Flow Rate: 4 to 6 gpm.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to repointing historic brick masonry.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.6 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic masonry repointing specialist. Experience in pointing or repointing only new or nonhistoric masonry is insufficient experience for masonry historic treatment work.
- B. Mockups: Prepare mockups of historic treatment on existing surfaces to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Repointing: Rake out joints in two separate areas, each approximately 36 inches high by 48 inches wide for each type of repointing required, and repoint one of the areas.

PART 2 - PRODUCTS

2.1 MORTAR MATERIALS

- A. Restoration Lime Putty Mortar Heritage Pre-Blended Lime Putty Mortar, as manufactured by US Heritage Group, Inc., or another firm producing specialty masonry products for historic restoration applications.
- B. Portland Cement: ASTM C 150/C 150M, Type I or Type II; white or gray or both where required for color matching of mortar.
 - 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Mortar Sand: ASTM C 144 unless otherwise indicated.
 - 1. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.
 - Color: Natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
 - 3. Provide sand with rounded edges.
- E. Mortar Pigments: ASTM C 979/C 979M, compounded for use in mortar mixes, and having a record of satisfactory performance in masonry mortars.
- F. Water: ASTM C 270, potable.

2.2 MORTAR MIXES

- A. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
 - 1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
- B. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.

- 1. Mortar Pigments: Where mortar pigments are indicated, do not add pigment exceeding 10 percent by weight of the cementitious or binder materials, except for carbon black, which is limited to 2 percent, unless otherwise demonstrated by a satisfactory history of performance.
- C. Do not use admixtures in mortar unless otherwise indicated.
- D. Mixes: Mix mortar materials in the following proportions:
 - 1. Repointing Mortar identified as Restoration Lime Putty: Pre-Blended Lime Putty consisting of one part hydraulic lime and 2.5 parts clean sharp sand color and appearance to match historic materials.
 - 2. Repointing Mortar for existing masonry assemblies circa. 1920 or newer: by Volume: ASTM C 270, Proportion Specification, 1 part portland cement, 6 parts lime, and 12 parts sand

PART 3 - EXECUTION

3.1 PROTECTION

- A. Prevent mortar from staining face of surrounding masonry and other surfaces.
- B. Remove gutters and downspouts and associated hardware adjacent to immediate work area and store during masonry repointing work. Reinstall when repointing is complete.
 - 1. Provide temporary rain drainage during work to direct water away from building.

3.2 MASONRY REPOINTING, GENERAL

A. Have repointing work performed only by qualified historic treatment specialist.

3.3 REPOINTING

- A. Rake out and repoint joints to the following extent:
 - 1. All joints in areas indicated.
 - 2. Joints indicated as sealant-filled joints. Seal joints according to Section 079200 "Joint Sealants."
 - 3. Joints at locations of the following defects:
 - a. Holes and missing mortar.
 - b. Cracks that can be penetrated 1/4 inch or more by a knife blade 0.027 inch thick.
 - c. Cracks 1/8 inch(es or more in width and of any depth.
 - d. Hollow-sounding joints when tapped by metal object.
 - e. Eroded surfaces 1/4 inch or more deep.
 - f. Deterioration to point that mortar can be easily removed by hand, without tools.
 - Joints filled with substances other than mortar.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows, according to procedures demonstrated in approved mockup:
 - 1. Remove mortar from joints to depth of 2 times joint width but not less than 1/2 inch. Do not remove unsound mortar more than 2inches deep; consult Architect for direction.

- 2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris
- 3. Do not spall edges of bricks or widen joints. Replace or patch damaged bricks as directed by Architect.
 - a. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar in bed joints and mortar in head joints by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.
- D. Notify Architect of unforeseen detrimental conditions, including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.

E. Pointing with Mortar:

- 1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
- 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8inch until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- 3. After deep areas have been filled to same depth as remaining joints, point joints by placing mortar in layers not greater than 3/8inch. Fully compact each layer and allow it to become thumbprint hard before applying next layer. Where existing brick have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
- 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
- 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours, including weekends and holidays.
 - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
- 6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Remove mortar and repoint.
- F. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

3.4 FINAL CLEANING

- A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, applied by low-pressure spray.
 - 1. Do not use metal scrapers or brushes.
 - 2. Do not use acidic or alkaline cleaners.

END OF SECTION 040323

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Miscellaneous steel framing and supports.
- B. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel lintels.
 - 2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 3. Steel weld plates and angles for casting into concrete.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
 - 2. Fasteners.
 - 3. Shop primers.
 - 4. Shrinkage-resisting grout.
 - 5. Prefabricated building columns.
- 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.

PART 2 - PRODUCTS

2.1 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. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide 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.
- B. Post-Installed Anchors: 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] [Group 2] stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- C. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

- A. 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.

2.4 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 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:
 - 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.
- 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. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 8 inches from ends and corners of units and 24 inches o.c.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. 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.
- B. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.
- C. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.

2.6 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.

2.7 GENERAL FINISH REQUIREMENTS

A. Finish metal fabrications after assembly.

2.8 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. 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 universal shop primer indicated.
- C. 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.

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.

3.2 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 REPAIRS

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055000

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Steel railings.

1.2 ACTION SUBMITTALS

- A. Product Data:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Handrail brackets.
 - 3. Shop primer.
 - 4. Intermediate coats and topcoats.
 - 5. Bituminous paint.
 - 6. Nonshrink, nonmetallic grout.
 - 7. Anchoring cement.
 - Metal finishes.
 - 9. Paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish.
- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code Steel."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.

- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
- b. Infill load and other loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

- A. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M, Type 5.
- B. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.

2.4 FASTENERS

- A. Fastener Materials:
 - 1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941, Class Fe/Zn 5 for zinc coating.
 - 2. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
 - 3. Aluminum Railing Components: [Type 304] [Type 316] stainless steel fasteners.
 - 4. Stainless Steel Railing Components: [Type 304] [Type 316] stainless steel fasteners.
- B. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193[or ICC-ES AC308].
 - 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] [Group 2] stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: Cast iron center of handrail 2-1/2 inches from wall.
- B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. 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.
- F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- G. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations, provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- B. Form work true to line and level with accurate angles and surfaces.
- C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #2 welds; good appearance, completely sanded joint, some undercutting and pinholes okay
- D. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

- E. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- F. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- I. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.
 - 1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 - 2. Coordinate anchorage devices with supporting structure.
- J. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.

PART 3 - EXECUTION

- 3.1 INSTALLATION, GENERAL
 - A. Perform cutting, drilling, and fitting required for installing railings.
 - 1. Fit exposed connections together to form tight, hairline joints.
 - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 - 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

- 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
- 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 - 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

3.2 ANCHORING POSTS

- A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:
- D. Install removable railing sections, where indicated on Drawing, in slip-fit stainless steel sockets cast in concrete.

3.3 ATTACHING RAILINGS

- A. Attach handrails to walls with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
- B. Secure wall brackets to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.
 - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 - 4. For steel-framed partitions, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
 - 5. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements, using self-tapping screws of size and type required to support structural loads.
 - 6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

C. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shoppainted surfaces.

3.4 CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055213

SECTION 061053 - MISCELL ANFOUS ROUGH CARPENTRY

PART 1 - GENERAL

SUMMARY 1.1

Section Includes: A.

- 1. Framing with dimension lumber.
- 2. Rooftop equipment bases and support curbs.
- Wood blocking, cants, and nailers. 3.
- Wood furring and grounds. 4.
- 5. Utility shelving.
- Plywood backing panels.

1.2 **ACTION SUBMITTALS**

A. Product Data: For each type of process and factory-fabricated product.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - Factory mark each piece of lumber with grade stamp of grading agency. 1.
 - Dress lumber, S4S, unless otherwise indicated. 2.
- В. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with A. ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates]
- В. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or 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 all miscellaneous carpentry unless otherwise indicated.
 - 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.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to 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 beyond the centerline of the burners at any time during the test.
 - 1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- C. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- D. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.4 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species.
- B. Other Framing: No. 2 grade of any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Southern pine; SPIB.
 - 3. Douglas fir-larch; WCLIB or WWPA.
 - 4. Spruce-pine-fir; NLGA.
 - 5. Douglas fir-south; WWPA.
 - 6. Hem-fir; WCLIB or WWPA.
 - 7. Douglas fir-larch (north); NLGA.
 - 8. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.5 MISCELLANEOUS LUMBER

- A. General: 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.
- 7. Utility shelving.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. Utility Shelving: Lumber with 15 percent maximum moisture content of eastern white pine, Idaho white, Iodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. Concealed Boards: 15 percent maximum moisture content of any of the following species and grades:
 - 1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
 - 2. Eastern softwoods, No. 2 Common grade; NELMA.
 - 3. Northern species, No. 2 Common grade; NLGA.
 - 4. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 5/8-inch nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where 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.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

2.8 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. 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]
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. ICC-ES evaluation report for fastener.

3.2 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 061053

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Interior trim, including non-fire-rated interior door and sidelight frames.
- 2. Shelving and clothes rods.

1.2 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. MDO: Plywood with a medium-density overlay on the face.
- C. PVC: Polyvinyl chloride.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.
- B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's 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. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: ANSI A135.4.
- D. MDF: ANSI A208.2, Grade 130.

2.2 INTERIOR TRIM

- A. Lumber Trim for Opaque Finish (Painted Finish):
 - 1. Species and Grade:
 - a. Alder, aspen, basswood, cottonwood, gum, magnolia, soft maple, sycamore, tupelo, or yellow poplar; NHLA A Finish.
 - 2. Maximum Moisture Content for softwoods: 15 percent.
 - 3. Maximum Moisture Content for Hardwoods: 10 percent.
 - 4. Finger Jointing: Not allowed.
 - 5. Face Surface: Surfaced (smooth).
- B. Moldings for Opaque Finish (Painted Finish): Made to patterns included in MMPA's "WM/Series Softwood Moulding Patterns."
 - 1. Hardwood Moldings: MMPA WM 4, P-grade.
 - a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
 - b. Maximum Moisture Content: 9 percent.
 - 2. Finger Jointing: Not allowed.

2.3 SHELVING AND CLOTHES RODS

- A. Exposed Closet Shelving: Made from the following material, 3/4 inch thick:
 - 1. MDO softwood plywood with solid-wood edge.
- B. Shelf Cleats: 3/4-by-5-1/2-inch boards with hole and notch to receive clothes rods, as specified above for shelving.
- C. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.
- D. Shelf Brackets without Rod Support: BHMA A156.16, B04041; prime-painted formed steel.
- E. Standards for Adjustable Shelf Brackets: BHMA A156.9, B04102; zinc-plated steel.
- F. Adjustable Shelf Brackets: BHMA A156.9, B04112; zinc-plated steel.
- G. Metal Clothes Rods: 1-5/16-inch-diameter, chrome-plated-steel tubes.
- H. Metal Rod Flanges: Chrome-plated steel.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.2 INSTALLATION, GENERAL

- A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
 - 1. Use concealed shims where necessary for alignment.
 - 2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.3 INSTALLATION OF STANDING AND RUNNING TRIM

- A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.
 - 1. Do not use pieces less than 24 inches long, except where necessary.
 - 2. Stagger joints in adjacent and related standing and running trim.
 - 3. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
 - 4. Use scarf joints for end-to-end joints.
 - 5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 6. Install trim after gypsum-board joint finishing operations are completed.
 - 7. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
 - 8. Fasten to prevent movement or warping.
 - 9. Countersink fastener heads on exposed carpentry work and fill holes.

3.4 INSTALLATION OF SHELVING AND CLOTHES RODS

- A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.
 - 1. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled.
 - 2. Space fasteners not more than 16 inches o.c. Use two fasteners at each framing member or fastener location for cleats 4 inches nominal in width and wider.
 - 3. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing.
 - 4. Remove adhesive that is squeezed out after fastening shelf cleats in place.

- B. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- C. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.
- D. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of ends of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- E. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled.
 - 1. Install shelves, fully seated on cleats, brackets, and supports.
 - 2. Fasten shelves to cleats with finish nails or trim screws, set flush.
 - 3. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
- F. Install rod flanges for rods as indicated.
 - 1. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
 - 2. Install rods in rod flanges.

END OF SECTION 062023

SECTION 070150.19 - PREPARATION FOR REPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Full tear-off of entire roof system except related and coordinated work performed by Owner's Abatement Contractor.
- 2. Re-cover preparation of entire roof area.
- 3. Removal of flashings and counterflashings.

1.2 ALLOWANCES

1.3 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Approved by warrantor of existing roofing system to work on existing roofing.

1.5 FIELD CONDITIONS

- A. Existing Roofing System: See Hazardous Materials Information for existing roofing system layers.
- B. Owner will not occupy portions of building immediately below reroofing area.
 - 1. Conduct reroofing so Owner's operations are not disrupted.
 - 2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
 - 3. Coordinate work activities daily with Owner.
- C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
 - 1. The results of an analysis of test cores from existing roofing system are available for Contractor's reference.
- F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
 - 1. Remove only as much roofing in one day as can be made watertight in the same day.

PART 2 - PRODUCTS

2.1 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
- B. Shut off rooftop utilities and service piping before beginning the Work.
- C. Test existing roof drains to verify that they are not blocked or restricted.
 - 1. Immediately notify Architect of any blockages or restrictions.
- D. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- E. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
 - 1. Prevent debris from entering or blocking roof drains and conductors.
 - a. Use roof-drain plugs specifically designed for this purpose.
 - b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
 - 2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
 - a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

- A. Notify Owner each day of extent of roof tear-off proposed for that day.
- B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.
- C. Full Roof Tear-off: Remove existing roofing and other roofing system components down to the existing roof deck.
 - 1. Remove base flashings and counter flashings.
 - 2. Remove perimeter edge flashing and gravel stops.
 - 3. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
 - 4. Remove roof drains indicated on Drawings to be removed.
 - 5. Remove wood blocking, curbs, and nailers.
 - 6. Remove fasteners from deck.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.
 - 1. Do not proceed with installation until directed by Architect.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.
 - 1. Do not proceed with installation until directed by Architect.
- D. Replace plywood roof sheathing as directed by Architect.

3.4 BASE FLASHING REMOVAL

- A. Remove existing base flashings.
 - 1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
- B. Inspect parapet, wood blocking, curbs, and nailers for deterioration and damage.
 - 1. If parapet, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.
- C. When directed by Architect, replace parapet framing, wood blocking, curbs, and nailers to comply with Section 061053 Miscellaneous Rough Carpentry."

END OF SECTION 070150.19

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Extruded polystyrene foam-plastic board insulation.
- 2. Polyisocyanurate foam-plastic board insulation.
- 3. Glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Extruded polystyrene foam-plastic board insulation.
 - 2. Polyisocyanurate foam-plastic board insulation.
 - 3. Glass-fiber blanket insulation.

1.3 INFORMATIONAL SUBMITTALS

- A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
 - 1. Sign, date, and post the certification in a conspicuous location on Project site.
- B. Product test reports.
- C. Research reports.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded Polystyrene Board Insulation, Type VI: ASTM C578, Type VI, 40-psi minimum compressive strength
 - 1. <u>Manufacturers:</u> 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. DiversiFoam Products.
 - b. <u>Dow Chemical Company (The).</u>
 - c. <u>Kingspan Insulation Limited</u>.
 - d. Owens Corning.
 - 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.

4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.2 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

- A. Polyisocyanurate Board Insulation, Foil Faced: ASTM C1289, foil faced, Type I, Class 1 or 2.
 - 1. <u>Manufacturers:</u> 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. Atlas Molded Products; a Division of Atlas Roofing Corporation.
 - b. Atlas Roofing Corporation.
 - c. Carlisle Coatings & Waterproofing Inc.
 - d. <u>Dow Chemical Company (The)</u>.
 - e. <u>Firestone Building Products</u>.
 - f. Hunter Panels.
 - g. Johns Manville; a Berkshire Hathaway company.
 - h. Rmax, Inc.
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
 - 3. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.3 GLASS-FIBER BLANKET INSULATION

- A. Glass-Fiber Blanket Insulation, Unfaced <Insert drawing designation>: ASTM C665, Type I;; passing ASTM E136 for combustion characteristics.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 2. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
 - 3. Smoke-Developed Index: Not more than 50 when tested in accordance with ASTM E84.
 - 4. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- B. Glass-Fiber Blanket Insulation, Polypropylene-Scrim-Kraft Faced: ASTM C665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).
 - 1. <u>Manufacturers:</u> 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. <u>CertainTeed Corporation</u>.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 2. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.

2.4 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- 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. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer.
 - 1. Fit courses of insulation between obstructions, with edges butted tightly in both directions, and with faces flush.
 - 2. Press units firmly against inside substrates.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. 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 clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For wood-framed construction, install blankets according to ASTM C1320 and as follows:

- a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction.
 - b. Interior Walls: Set units with facing placed toward areas of high humidity.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
 - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

END OF SECTION 072100

SECTION 074646 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fiber-cement siding to be used as an exterior finish where filling the existing window opening sharing the property line with the adjacent property.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

- A. General: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E136; with a flame-spread index of 25 or less when tested according to ASTM E84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. <u>American Fiber Cement Corporation</u>.
 - b. <u>CertainTeed Corporation</u>.
 - c. GAF.
 - d. James Hardie Building Products, Inc.
- B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- C. Nominal Thickness: Not less than 5/16 inch.
- D. Panel Texture: 48-inch-wide sheets with smooth texture.
- E. Factory Priming: Manufacturer's standard acrylic primer.

2.2 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
- B. Flashing: Provide stainless-steel flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

C. Fasteners:

1. For fastening to wood, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch into substrate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Install fasteners no more than 24 inches o.c.
- B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.2 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 075423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

1.1 **SUMMARY**

A. Section Includes:

- 1. Adhered thermoplastic polyolefin (TPO) roofing system.
- 2. Roof insulation.
- 3. Cover board.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 **ACTION SUBMITTALS**

- A. Product Data: For each type of product.
 - For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav or SPRI's 1. Directory of Roof Assemblies listing.
- В. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 - Layout and thickness of insulation. 1.
 - 2. Base flashings and membrane termination details.
 - 3. Flashing details at penetrations.
 - Tapered insulation layout, thickness, and slopes. 4.
- C. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

INFORMATIONAL SUBMITTALS 1.4

Α. Manufacturer Certificates:

- 1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - Submit evidence of compliance with performance requirements.
- 2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.
- В. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
- C. Sample warranties.

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1.5 CLOSFOUT SUBMITTALS

- A. Maintenance data.
- B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
- B. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:
- D. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- E. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- F. THERMOPLASTIC POLYOLEFIN (TPO) ROOFING
- G. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, TPO sheet.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle SynTec Incorporated.
 - b. Firestone Building Products.
 - c. Flex Membrane International Corp.
 - d. GAF.
 - e. <u>Johns Manville; a Berkshire Hathaway company.</u>
 - 2. Thickness: 60 mils, nominal.

3. Exposed Face Color: White.

2.2 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Bonding Adhesive: Manufacturer's standard.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <u>Carlisle SynTec Incorporated.</u>
 - b. Firestone Building Products.
 - c. GAF.
 - d. <u>Johns Manville; a Berkshire Hathaway company</u>.
 - 2. Size: 48 by 96 inches.
 - 3. Thickness:
 - a. Base Layer: 1-1/2 inches.
 - b. Upper Layer: As indicated in Drawings.

2.4 INSULATION ACCESSORIES

- A. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

- 1. Modified asphaltic, asbestos-free, cold-applied adhesive.
- C. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M fiber-reinforced gypsum board.
 - 1. < Double click here to find, evaluate, and insert list of manufacturers and products, >
 - 2. Thickness: 1/2 inch.
 - 3. Surface Finish: Factory primed.

2.5 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
 - 1. Size: Approximately 36 by 60 inches.
 - 2. Color: Contrasting with roof membrane.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

3.2 PREPARATION

A. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

3.3 INSTALLATION OF ROOFING, GENERAL

A. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

3.4 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Wood
 - 1. Mechanically fasten slip sheet to roof deck using mechanical fasteners specifically designed and sized for fastening slip sheet to wood decks.
 - 2. Install base layer of insulation with end joints staggered not less than 12 inches in adjacent rows.

- a. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
- b. Make joints between adjacent insulation boards not more than 1/4 inch in width.
- c. Fill gaps exceeding 1/4 inch with insulation.
- d. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- 3. Install upper layers of insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. Fill gaps exceeding 1/4 inch with insulation.
 - e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - f. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:

3.5 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows.

 Offset joints of insulation below a minimum of 6 inches in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 - 3. Cut and fit cover board tight to nailers, projections, and penetrations.

3.6 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.

190101

- H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
- I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.7 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 INSTALLATION OF WALKWAYS

- A. Flexible Walkways:
 - 1. Install flexible walkways at the following locations:
 - a. Perimeter of each rooftop unit.
 - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - d. As required by roof membrane manufacturer's warranty requirements.
 - 2. Provide 6-inch clearance between adjoining pads.
 - 3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Manufactured reglets with counterflashing.
- 2. Formed roof-drainage sheet metal fabrications.
- 3. Formed low-slope roof sheet metal fabrications.
- 4. Formed steep-slope roof sheet metal fabrications.
- 5. Formed wall sheet metal fabrications.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

- A. Product Data: For each of the following
 - 1. Underlayment materials.
 - 2. Elastomeric sealant.
 - 3. Butyl sealant.
 - 4. Epoxy seam sealer.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.
 - 7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 - 8. Include details of roof-penetration flashing.
 - 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashings.
 - 10. Include details of special conditions.
 - 11. Include details of connections to adjoining work.
- C. Samples: For each exposed product and for each color and texture specified, 12 inches long by actual width.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.
- B. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance data.
- B. Special warranty.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: 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.
 - 1. For copings and roof edge flashings that are ANSI/SPRI/FM 4435/ES-1 tested shop shall be listed as able to fabricate required details as tested and approved.

1.7 WARRANTY

- A. Special Warranty on Finishes: 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 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - 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 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, 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 watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual"] requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHFFT MFTALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet in accordance with ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet in accordance with ASTM A792/A792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A755/A755M.
 - 1. Surface: Smooth, flat.
 - 2. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Color: As selected by Architect from manufacturer's full range.
 - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

- A. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F; and complying with physical requirements of ASTM D226/D226M for Type I and Type II felts.
 - 1. <u>Manufacturers:</u> 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. <u>Atlas Molded Products; a Division of Atlas Roofing Corporation.</u>
 - b. <u>Intertape Polymer Group</u>.
 - c. <u>Kirsch Building Products, LLC</u>.
 - d. SDP Advanced Polymer Products Inc.

2.4 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as 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. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
- 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 Zinc-Coated (Galvanized) or aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329.

C. Solder:

- 1. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead with maximum lead content of 0.2 percent.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- F. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.
- G. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- H. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. Fry Reglet Corporation.
 - b. <u>Hohmann & Barnard, Inc</u>.
 - c. National Sheet Metal Systems, Inc.
 - d. OMG, Inc.
 - 2. Material: Galvanized steel, 0.022 inch thick.
 - 3. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
 - 4. Accessories:
 - a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
 - b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.
 - 5. Finish: Mill with manufacturer's standard color coating.

2.5 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 2. 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.

- 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
- 4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
- 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

- 1. 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 indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams:

- 1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- 2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

G. Hanging Gutters:

- 1. Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required.
- 2. Fabricate in minimum 96-inch-long sections.
- 3. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness.
- 4. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
- 5. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
 - a. Galvanized Steel: 0.022 inch thick.
 - b.
- H. Downspouts: Fabricate round downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
 - 1. Fabricate from the following materials:
 - a. Galvanized Steel: 0.028 inch thick.
- I. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch-wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof.Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch thick.
- J. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim, and built-in overflows. Fabricate from the following materials:
 - 1. Galvanized Steel: [0.028 inch] < Insert dimension > thick.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-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, [fasten and seal] [solder or weld] watertight. [Shop fabricate interior and exterior corners.]
 - 1. Fabricate from the following materials:
 - a. Galvanized Steel: 0.040 inch thick.
- B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - Galvanized Steel: 0.028 inch thick.
- C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - Galvanized Steel: 0.022 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT

- A. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
 - 1. Lap horizontal joints not less than 4 inches.
 - 2. Lap end joints not less than 12 inches.

3.2 INSTALLATION, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 - 1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
 - 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 - 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
 - 6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 - 8. Do not field cut sheet metal flashing and trim by torch.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

- 1. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
- 2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 - 1. Use sealant-filled joints unless otherwise indicated.
 - a. Form joints to completely conceal sealant.
 - b. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
 - c. Adjust setting proportionately for installation at higher ambient temperatures.
 - 1) Do not install sealant-type joints at temperatures below 40 deg F.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.
 - 1. Pretin edges of sheets with solder to width of 1-1/2 inches; however, reduce pretinning where pretinned surface would show in completed Work.

3.3 INSTALLATION OF ROOF-DRAINAGE SYSTEM

- A. Install sheet metal roof-drainage items to produce complete roof-drainage system in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters:
 - 1. Join sections with joints sealed with sealant.
 - 2. Provide for thermal expansion.
 - 3. Attach gutters at eave or fascia to firmly anchor them in position.
 - 4. Provide end closures and seal watertight with sealant.
 - 5. Slope to downspouts.
- C. Downspouts:
 - 1. Join sections with 1–1/2-inch telescoping joints.
 - 2. Provide hangers with fasteners designed to hold downspouts securely to walls.
 - 3. Locate hangers at top and bottom and at approximately 60 inches o.c.
 - 4. Provide elbows at base of downspout to direct water away from building.
- D. Parapet Scuppers:
 - 1. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
 - 2. Anchor scupper closure trim flange to exterior wall and seal with elastomeric sealant to scupper.

- 3. Loosely lock front edge of scupper with conductor head.
- 4. Solder or seal with elastomeric sealant exterior wall scupper flanges into back of conductor head.
- E. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below scupper discharge.
- F. Expansion–Joint Covers: Install expansion–joint covers at locations and of configuration indicated on Drawings. Lap joints minimum of 4 inches in direction of water flow.

3.4 INSTALLATION OF ROOF FLASHINGS

- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
 - 1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
 - 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing:
 - 1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
- C. Copings:
 - 1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.
 - 1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
 - 2. Extend counterflashing 4 inches over base flashing.
 - 3. Lap counterflashing joints minimum of 4 inches.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.5 INSTALLATION OF WALL FLASHINGS

- A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Reglets: Installation of reglets is specified in 075432 "TPO Roofing"

3.6 INSTALLATION 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 indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING

- 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.

3.8 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. 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, as determined by Architect.

END OF SECTION 076200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Penetration firestopping systems for the following applications:
 - a. Penetrations in fire-resistance-rated walls.
 - b. Penetrations in horizontal assemblies.
 - c. Penetrations in smoke barriers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

- 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. <u>Manufacturers:</u> 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. 3M Fire Protection Products.
 - b. <u>A/D Fire Protection Systems Inc.</u>
 - c. Hilti, Inc.
 - d. <u>Tremco, Inc</u>.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning Penetration Firestopping Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.3 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.

- Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements. В.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413

SECTION 078443 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Joints in or between fire-resistance-rated constructions.
- Joints in smoke barriers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

1.4 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Approvals according to FM Approvals 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 JOINT FIRESTOPPING SYSTEMS

A. Joint Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping

systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

- B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined per ASTM E1966 or UL 2079.
 - 1. <u>Manufacturers:</u> 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. 3M Fire Protection Products.
 - b. A/D Fire Protection Systems Inc.
 - c. Hilti, Inc.
 - d. Tremco, Inc.
 - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- C. Joints in Smoke Barriers: Provide joint firestopping systems with ratings determined per UL 2079 based on testing at a positive pressure differential of 0.30-inch wg.
 - 1. <u>Manufacturers:</u> 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. 3M Fire Protection Products.
 - b. A/D Fire Protection Systems Inc.
 - c. Hilti, Inc.
 - d. Tremco, Inc.
 - 2. L-Rating: Not exceeding 5.0 cfm/ft. of joint at both ambient and elevated temperatures.
- D. Accessories: Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. General: Install joint firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- C. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing elastomeric fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- D. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:

- 1. Elastomeric fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
- 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
- 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Joint Identification: Identify joint firestopping systems with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels are visible to anyone seeking to remove or joint firestopping system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning Joint Firestopping Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078443

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Mildew-resistant joint sealants.
 - 3. Latex joint sealants.

1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Preconstruction laboratory test reports.
- C. Preconstruction field-adhesion-test reports.
- D. Field-adhesion-test reports.
- E. Sample warranties.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.

1.5 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.
 - 1. <u>Manufacturers:</u> 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. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - b. Pecora Corporation.
 - c. Sika Corporation; Joint Sealants.
 - d. The Dow Chemical Company.

2.3 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - 1. <u>Manufacturers:</u> 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. May National Associates, Inc.; a subsidiary of Sika Corporation.
 - b. Pecora Corporation.
 - c. The Dow Chemical Company.
 - d. <u>Tremco Incorporated</u>.

2.4 JOINT-SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C1330, [Type C (closed-cell material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.

3.3 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.
 - 1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - 2. Joint Sealant: Acrylic latex.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 080314 - HISTORIC TREATMENT OF WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes historic treatment of wood doors in the form of the following:
 - 1. Repairing wood doors and trim.
 - 2. Reglazing.
 - 3. Repairing, refinishing, and replacing hardware.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures."

1.2 DEFINITIONS

- A. Door: Generally, this term includes door frame, leaves, hardware, side panels or lights, fan light, transom, storm doors and screen doors unless otherwise indicated by context.
- B. Exterior Trim: Exterior casing, brick mold, and cornice or drip cap.
- C. Interior Trim: Casing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of wood doors and fire protection.
 - 2. Review methods and procedures related to historic treatment of wood doors.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, and sections showing locations and details of each new unit and its corresponding door locations in the building on annotated plans and elevations.
- C. Samples: For each exposed product and for each color and texture specified.

1.5 QUALITY ASSURANCE

A. Historic Treatment Specialist Qualifications: A qualified historic wood door specialist, experienced in repairing, refinishing, and replacing wood doors in whole and in part. Experience only in fabricating and installing new wood doors is insufficient experience for wood-door historic treatment work.

- B. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar historic wood-treatment applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- C. Mockups: Prepare mockups of historic treatment repair processes to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation. Prepare mockups so they are as inconspicuous as practicable.
 - 1. Wood Door Repair: Prepare one entire door unit to serve as mockup to demonstrate Samples of each type of repair of wood door members including frame, leaves, glazing, and hardware.

PART 2 - PRODUCTS

2.1 HISTORIC TREATMENT OF WOOD DOORS, GENERAL

- A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grades of wood doors, and other requirements unless otherwise indicated.
 - 1. Exception: Industry practices cited in the "Architectural Woodwork Standards," Section 12, Article 1.5, "Industry Practices," do not apply to the work of this Section.

2.2 WOOD-REPLACEMENT MATERIALS

- A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.
 - 1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.

2.3 WOOD-REPAIR MATERIALS

- A. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated because of weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.
 - 1. <u>Manufacturers:</u> 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. <u>Abatron, Inc</u>.
 - b. ConServ Epoxy LLC.
 - c. <u>Gougeon Brothers, Inc.</u>
- B. Wood-Patching Compound: Two-part epoxy-resin wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated because of weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.

- 1. <u>Manufacturers:</u> 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. Abatron, Inc.
 - b. ConServ Epoxy LLC.
 - c. <u>Gougeon Brothers, Inc.</u>

2.4 GLAZING MATERIALS

- A. Glass: See Section 088000 "Glazing."
- B. Glazing Systems:
 - 1. Traditional Glazing Products: Glazing points and oil-based glazing putty or latex glazing compound. Tint to required color according to manufacturer's written instructions.
 - 2. Primers and Cleaners for Glazing: As recommended in writing by glazing material manufacturer.

2.5 HARDWARE

- A. Primary Door Hardware, General: Provide complete sets of door hardware consisting of hinges, pulls, locks, latches, and accessories indicated for each door or required for proper operation. Sets shall include replacement hardware to complement repaired and refinished, existing hardware. Door hardware shall smoothly operate, tightly close, and securely lock wood doors and be sized to accommodate frequency of use, glazing weight, and dimensions.
- B. Replacement Hardware: Replace existing damaged or missing hardware with new hardware.
- C. Material and Design:
 - 1. Material: Solid bronze of alloy indicated unless otherwise indicated.
 - 2. Design: Match type and appearance of existing hardware.
- D. Hardware Finishes: Comply with BHMA A156.18 for base material and finish requirements indicated.

2.6 MISCELLANEOUS MATERIALS

- A. Insect Screening:
 - 1. Copper Wire Fabric: 16-by-16 count per sq. in. mesh of 0.011-inch-diameter copper wire.
 - 2. Bronze Wire Fabric: 18-by-14 count per sq. in. mesh of [0.009-inch-] [0.011-inch-] diameter bronze wire with a clear varnish finish.
 - 3. Aluminum Wire Fabric: 18-by-16 count per sq. in. mesh of 0.011-inch-diameter, coated aluminum wire; [natural bright] [charcoal gray] [black] finish.
- B. Borate Preservative Treatment: Inorganic, borate-based solution, with disodium octaborate tetrahydrate as the primary ingredient; manufactured for preserving weathered and decayed wood from further damage by decay fungi and wood-boring insects; complying with AWPA P5; containing no boric acid.
- C. Cleaning Materials:
 - 1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.

- 2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.
- D. Adhesives: Wood adhesives with minimum 15- to 45-minute cure at 70 deg F, in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair and exposure conditions.
- E. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.
 - 1. Match existing fasteners in material and type of fastener unless otherwise indicated.
 - 2. Use concealed fasteners for interconnecting wood components.
 - 3. Use concealed fasteners for attaching items to other work unless exposed fasteners are unavoidable or the existing fastening method.
 - 4. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.
 - 5. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
 - 6. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.
- F. Anchors, Clips, and Accessories: Fabricate anchors, clips, and door accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel complying with requirements in ASTM B 633 for SC 3 (Severe) service condition.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean wood doors of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.
- B. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 HISTORIC TREATMENT OF WOOD DOORS, GENERAL

- A. General: In treating historic items, disturb them as minimally as possible and as follows:
 - 1. Stabilize and repair wood doors to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 - 2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
 - 3. Repair items in place where possible.
 - 4. Install temporary protective measures to protect wood door work that is indicated to be completed later.
 - 5. Refinish historic wood windows according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated
- B. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods such as sanding, wire brushing, or power tools except as approved by Architect.
- C. Repair and Refinish Existing Hardware: Dismantle door hardware; strip paint, repair, and refinish it to match finish Samples; and lubricate moving parts just enough to function smoothly.

- D. Repair Wood Doors: Match existing materials and features, retaining as much original material as possible to perform repairs.
 - 1. Unless otherwise indicated, repair wood doors by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
 - 2. Where indicated, repair wood doors by limited replacement matching existing material.
- E. Replace Wood Units: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.
- F. Protection of Openings: Where doors are indicated for removal, cover resultant openings with temporary enclosures so that openings are weathertight during repair period.
- G. Identify removed doors, frames, leaves, and members with numbering system corresponding to door locations to ensure reinstallation in same location.

3.3 WOOD DOOR PATCH-TYPE REPAIR

- A. General: Patch wood members that exhibit depressions, holes, or similar voids and that have limited amounts of rotted or decayed wood.
 - 1. Remove rotted or decayed wood down to sound wood.
- B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood.
- C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.
 - 1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
 - 2. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled
 - 3. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.

3.4 WOOD DOOR MEMBER-REPLACEMENT REPAIR

- A. General: Replace parts of or entire wood door members at locations [indicated on Drawings] [scheduled] [and] [where damage is too extensive to patch] < Insert requirement > .
 - 1. Remove broken, rotted, and decayed wood down to sound wood.
 - 2. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
 - 3. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.
- B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.
- C. Repair remaining depressions, holes, or similar voids with patch-type repairs.

- D. Glazing: Reglaze units before reinstallation.
 - 1. Provide replacement glazing stops coordinated with glazing system indicated.
 - 2. Provide glazing stops to match contour of door frames.
- E. Reinstall units removed for repair into original openings.
- F. Weather Stripping: Replace nonfunctioning and install missing weather stripping to ensure full-perimeter weather stripping for each exterior leaf.

3.5 GLAZING

- A. Comply with combined written instructions of manufacturers of glass, glazing system, and glazing materials, unless more stringent requirements are indicated.
- B. Remove cracked and damaged glass and glazing materials from openings and prepare surfaces for reglazing.
- C. Remove existing glass and glazing where indicated in a schedule, and prepare surfaces for reglazing.
- D. Remove glass and glazing from openings and prepare surfaces for reglazing.
- E. Size glass as required by Project conditions to provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances.
- F. Apply primers to joint surfaces where required for adhesion of glazing system, as determined by preconstruction testing.
- G. Install setting bead, side beads, and back bead against stop in glazing rabbets before setting glass.
- H. Install glass with proper orientation so that coatings, if any, face exterior or interior as required.
- I. Disposal of Removed Glass: Remove from Owner's property and legally dispose of it unless otherwise indicated.

END OF SECTION 080314

SECTION 080352 - HISTORIC TREATMENT OF WOOD WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes historic treatment of wood windows in the form of the following:
 - 1. Repairing wood windows and trim.
 - 2. Reglazing.
 - 3. Repairing, refinishing, and replacing hardware.
 - 4. Providing new storm-window and insect-screen units.

B. Related Requirements:

- 1. Section 011000 "Summary" for coordination with Owner's separate ACM Abatement Contractor.
- 2. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

1.2 DEFINITIONS

- A. Window: Includes window frame, sash, hardware, trim, storm window, and exterior and interior shutters unless otherwise indicated by context.
- B. Exterior Trim: Exterior casing, brick mold, and cornice or drip cap.
- C. Interior Trim: Casing, stool, and apron.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of wood windows and fire protection.
 - 2. Review methods and procedures related to historic treatment of wood windows.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, and sections showing locations and details of each new unit and its corresponding window locations in the building on annotated plans and elevations.
- C. Samples: For each exposed product and for each color and texture specified.

1.5 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic wood window specialist, experienced in repairing, refinishing, and replacing wood windows in whole and in part. Experience only in fabricating and installing new wood windows is insufficient experience for wood-window historic treatment work.
- B. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar historic wood-treatment applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.

PART 2 - PRODUCTS

2.1 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

- A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grades of wood windows, and other requirements unless otherwise indicated.
 - 1. Exception: Industry practices cited in Section 12, Article 1.5, Industry Practices, of the Architectural Woodwork Standards do not apply to the work of this Section.

2.2 STORM WINDOWS

- A. General: Custom fabricated, tight fitting, and with operating and latching hardware.
 - 1. Fabricate storm windows for installation on outside of primary window.
 - 2. Fabricate storm window frame and sash so as not to be visible from the interior.
 - 3. Make storm windows removable for cleaning and storage.
- B. Wood Storm Windows:
 - 1. Wood Species: Cedar.
 - 2. Wood Storm-Window Members: Match design reference sample.
 - 3. Hardware: As required to secure storm window to window frames.
 - 4. Glazing Material: Uncoated clear float glass.

2.3 INSECT SCREENS

- A. Wood Insect-Screen Frames: Custom fabricated; tight fitting and removable and with a minimum of exposed fasteners and latches.
 - 1. Wood Species: Cedar.
- B. Wickets: Provide hinged wickets matching insect-screen frame material and finish; framed and trimmed for a tight fit and durability during use.
- C. Aluminum Wire Fabric: 18-by-16 count per sq. in. mesh of 0.011-inch-diameter, coated aluminum wire; black finish.

2.4 WOOD-REPLACEMENT MATERIALS

- A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.
 - 1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.

2.5 WOOD-REPAIR MATERIALS

- A. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.
 - 1. <u>Manufacturers:</u> 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. Abatron, Inc.
 - b. ConServ Epoxy LLC.
 - c. Gougeon Brothers, Inc.
- B. Wood-Patching Compound: Two-part epoxy-resin wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.
 - 1. <u>Manufacturers:</u> 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. <u>Abatron, Inc</u>.
 - b. ConServ Epoxy LLC.
 - c. Gougeon Brothers, Inc.

2.6 GLAZING MATERIALS

- A. Glass: [See Section 088000 "Glazing."] < Insert requirement > .
- B. Glazing Systems:
 - 1. Traditional Glazing Products: Glazing points and oil-based glazing putty or latex glazing compound. Tint to required color according to manufacturer's written instructions.
 - 2. Primers and Cleaners for Glazing: As recommended in writing by glazing material manufacturer.

2.7 HARDWARE

- A. Window Hardware: Provide complete sets of window hardware consisting of sash balances, hinges, pulls, latches, and accessories indicated for each window or required for proper operation. Sets shall include replacement hardware to complement repaired and refinished, existing hardware. Window hardware shall smoothly operate, tightly close, and securely lock wood windows and be sized to accommodate sash or ventilator weight and dimensions.
- B. Replacement Hardware: Replace existing damaged or missing hardware with new hardware.

C. Material and Design:

- 1. Material: Solid bronze of alloy indicated unless otherwise indicated.
- 2. Design: Match type and appearance of existing hardware.
- 3. Weight and Pulley Sash-Balance: Concealed weight and pulley balance system including steel or cast iron weights, cast-bronze pulleys, synthetic sash cord or sash chain; size and capacity to hold sash stationary at any open position.
- D. Hardware Finishes: Comply with BHMA A156.18 for base material and finish requirements indicated.

2.8 WEATHER STRIPPING

- A. Compression-Type Weather Stripping: Compressible weather stripping designed for permanently resilient sealing under bumper or wiper action; completely concealed when window is closed.
 - 1. Weather-Stripping Material: Match existing materials and profiles as much as possible unless otherwise indicated.
 - a. Cellular Elastomeric Gaskets: Preformed; complying with ASTM C 509.
 - b. Dense Elastomeric Gaskets: Preformed; complying with ASTM C 864.
 - 2. Weather Seals: Provide weather stripping with integral barrier fin or fins of semirigid, polypropylene sheet or polypropylene-coated material.

2.9 MISCELLANEOUS MATERIALS

- A. Borate Preservative Treatment: Inorganic, borate-based solution, with disodium octaborate tetrahydrate as the primary ingredient; manufactured for preserving weathered and decayed wood from further damage by decay fungi and wood-boring insects; complying with AWPA P5; containing no boric acid.
- B. Cleaning Materials:
 - 1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
 - 2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.
- C. Adhesives: Wood adhesives for exterior exposure, with minimum 15- to 45-minute cure at 70 deg F, in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair.
- D. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.
 - 1. Match existing fasteners in material and type of fastener unless otherwise indicated.
 - 2. Use concealed fasteners for interconnecting wood components.
 - 3. Use concealed fasteners for attaching items to other work unless exposed fasteners are unavoidable or the existing fastening method.
 - 4. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.
 - 5. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
 - 6. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.

E. Anchors, Clips, and Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel complying with requirements in ASTM B 633 for SC 3 (Severe) service condition.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean wood windows of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.
- B. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

- A. General: In treating historic items, disturb them as minimally as possible and as follows:
 - 1. Stabilize and repair wood windows to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 - 2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
 - 3. Repair items in place where possible.
 - 4. Install temporary protective measures to protect wood window work that is indicated to be completed later.
 - 5. Refinish historic wood windows according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
- B. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods such as sanding, wire brushing, or power tools except as approved by Architect.
- C. Repair and Refinish Existing Hardware: Dismantle window hardware; strip paint, repair, and refinish it to match finish samples; and lubricate moving parts just enough to function smoothly.
- D. Repair Wood Windows: Match existing materials and features, retaining as much original material as possible to perform repairs.
 - 1. Unless otherwise indicated, repair wood windows by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
 - 2. Where indicated, repair wood windows by limited replacement matching existing material.
 - 3. Sash Balance: Repair sash balances to function according to type as specified in "Hardware" Article" above. Provide missing sash balances.
- E. Replace Wood Units: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.
- F. Protection of Openings: Where sash or windows are indicated for removal, cover resultant openings with temporary enclosures so that openings are weathertight during repair period.

G. Identify removed windows, frames, sash, and members with numbering system corresponding to window locations to ensure reinstallation in same location.

3.3 WOOD WINDOW PATCH-TYPE REPAIR

- A. General: Patch wood members that exhibit depressions, holes, or similar voids, and that have limited amounts of rotted or decayed wood.
 - 1. Treat wood members with wood consolidant before applying patching compound. Coat wood surfaces by brushing, applying multiple coats until wood is saturated and unable to absorb more. Allow treatment to harden before filling void with patching compound.
 - 2. Remove rotted or decayed wood down to sound wood.
- B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood.
- C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.
 - 1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
 - 2. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
 - 3. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.

3.4 WOOD WINDOW MEMBER-REPLACEMENT REPAIR

- A. General: Replace parts of or entire wood window members at locations [indicated on Drawings] [scheduled] [and] [where damage is too extensive to patch] < Insert requirement >.
 - 1. Remove broken, rotted, and decayed wood down to sound wood.
 - 2. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
 - 3. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.
- B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.
- C. Repair remaining depressions, holes, or similar voids with patch-type repairs.
- D. Glazing: Reglaze units before reinstallation.
 - 1. Mill new and rout existing glazed members to accommodate new glass thickness.
 - 2. Provide replacement glazing stops coordinated with glazing system indicated.
 - 3. Provide glazing stops to match contour of sash frames.
- E. Reinstall units removed for repair into original openings.
- F. Weather Stripping: Replace nonfunctioning and install missing weather stripping to ensure full-perimeter and meeting rail weather stripping for each operable sash.

3.5 GLAZING

- A. Comply with combined written instructions of manufacturers of glass, glazing systems, and glazing materials, unless more stringent requirements are indicated.
- B. Remove cracked and damaged glass and glazing materials from openings and prepare surfaces for reglazing.
- C. Size glass as required by Project conditions to provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances.
- D. Apply primers to joint surfaces where required for adhesion of glazing system, as determined by preconstruction testing.
- E. Install setting bead, side beads, and back bead against stop in glazing rabbets before setting glass.
- F. Install glass with proper orientation so that coatings, if any, face exterior or interior as required.
- G. Disposal of Removed Glass: Remove from Owner's property and legally dispose of it unless otherwise indicated.

3.6 STORM WINDOW INSTALLATION

A. Install wood storm windows at each window jamb indicated.

3.7 INSECT-SCREEN INSTALLATION

- A. Install wood insect-screen frames for each operable exterior sash or ventilator>.
 - 1. Locate insect-screen frames on outside of window unless otherwise indicated.
- B. Install insect screening to be smooth, flat, and uniformly taut.

END OF SECTION 080352

SECTION 081433 - STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Exterior stile and rail wood doors.
- 2. Interior stile and rail wood doors.
- 3. Interior fire-rated stile and rail wood doors.
- 4. Fire-rated wood door frames.
- 5. Factory fitting stile and rail wood doors to frames and factory machining for hardware.
- 6. Factory priming.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, including the following:
 - 1. Details of construction and glazing.
 - 2. Door frame construction.
 - 3. Factory-machining criteria.
 - Factory-priming specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:
 - 1. Door schedule indicating door and frame location, type, size, fire protection rating, and swing.
 - 2. Door elevations, dimensions and location of hardware, lite locations, and glazing thickness.
 - 3. Details of frame for each frame type, including dimensions and profile.
 - 4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 - 5. Clearances and undercuts.
 - 6. Requirements for veneer matching.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, section 5.2.3.1.
 - 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, section 7.2.1.15.4.
 - 3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Field quality control reports.

1.4 CLOSEOUT SUBMITTALS

 A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Door Thermal Transmittance: Maximum whole fenestration product U-factor of 0.40 Btu/sq. ft. x h x deg F, according to AAMA 1503, ASTM E1423, or NFRC 100.
- B. Fire-Rated Wood Door and Frame Assemblies: Complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated on Drawings, based on testing at positive pressure according to UL 10C.
 - 1. Temperature-Rise Limit: [Where indicated on Drawings] [At vertical exit enclosures and exit passageways], provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- C. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.2 MATERIALS

- A. Use only materials that comply with referenced standards and other requirements specified.
 - 1. Assemble exterior doors, including components, with wet-use adhesives complying with ASTM D5572 for finger joints and with ASTM D5751 for joints other than finger joints.
 - 2. Assemble interior doors, including components, with either dry-use or wet-use adhesives complying with ASTM D5572 for finger joints and with ASTM D5751 for joints other than finger joints.
- B. Panel Products: Any of the following unless otherwise indicated:
 - 1. Particleboard: ANSI A208.1, Grade M-2.
 - 2. Medium-density fiberboard (MDF,) complying with ANSI A208.2, Grade 130.
 - 3. Hardboard complying with ANSI A135.4.
 - Veneer-core plywood.
- C. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

2.3 EXTERIOR STILE AND RAIL WOOD DOORS

- A. Exterior Stile and Rail Wood Doors: Exterior custom doors complying with the AWI, AWMAC, and WI's Architectural Woodwork Standards, or WDMA I.S. 6A, and with other requirements specified.
 - 1. Performance Grade: WDMA I.S. 6A Heavy Duty.
 - 2. WDMA I.S. 6A Grade: Custom
 - 3. Panel Designs: As indicated on Drawings.

- a. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval.
- b. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- 4. Finish: Opaque.
- 5. Door Construction for Opaque Finish:
 - a. Stile and Rail Construction: Veneered, structural composite lumber or veneered edge- and end-glued lumber.
 - b. Raised-Panel Construction: Veneered, wood-based panel product.
- 6. Stile and Rail Widths: As indicated on Drawings.
 - a. Stiles, Top and Intermediate Rails: 5-3/8 inches.
 - b. Bottom Rails: 11-3/8 inches.
- 7. Raised-Panel Thickness: Manufacturer's standard, but not less than 1-1/8 inches.
- 8. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
- 9. Glass: Uncoated, clear, insulating-glass units made from two lites of 3.0-mm-thick, fully tempered glass with 1/4-inch interspace, complying with Section 088000 "Glazing."
- 10. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S. 6A and grade specified.

2.4 INTERIOR STILE AND RAIL WOOD DOORS

- A. Interior Stile and Rail Wood Doors: Interior custom doors complying with WDMA I.S. 6A and with other requirements specified.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. <u>Assa Abloy, Maiman</u>.
 - b. ETO Doors Corp.
 - c. <u>VT Industries Inc.</u>
 - 2. Performance Grade: WDMA I.S. 6A Heavy Duty.
 - 3. WDMA I.S. 6A Grade: Custom.
 - 4. Panel Designs: Indicated on Drawings. 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.
 - 5. Finish: Opaque.
 - 6. Door Construction for Opaque Finish:
 - a. Stile and Rail Construction: Veneered, structural composite lumber or veneered edge- and end-glued
 - b. Raised-Panel Construction: Shaped, medium-density fiberboard.
 - 7. Stile and Rail Widths: Manufacturer's standard, but not less than the following:
 - a. Stiles, Top and Intermediate Rails: 4-1/2 inches.
 - b. Bottom Rails: 9 inches.
 - 8. Raised-Panel Thickness: Manufacturer's standard, but not less than 1-1/8 inches.
 - 9. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.

10. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S. 6A and grade specified.

2.5 INTERIOR FIRE-RATED STILE AND RAIL WOOD DOORS

- A. Interior Fire-Rated Stile and Rail Wood Doors: Fire-rated (20-minute rating) doors complying with WDMA I.S. 6A and with other requirements specified.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. Assa Abloy, Maiman.
 - b. <u>Eggers Industries</u>.
 - c. VT Industries Inc.
 - 2. Performance Grade: WDMA I.S. 6A Heavy Duty.
 - 3. WDMA I.S. 6A Grade: Custom.
 - 4. Panel Designs: Indicated on Drawings. 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.
 - 5. Finish: Opaque.
 - 6. Door Construction for Opaque Finish: 1-3/4-inch-thick stiles and rails and veneered raised panels not less than 1-1/8 inches thick.
 - a. Stile and Rail Construction: Veneered, structural composite lumber or veneered edge- and end-glued lumber
 - b. Raised-Panel Construction: Shaped medium-density fiberboard (MDF.)
 - c. Edge Construction for Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 - 7. Stile and Rail Widths: Manufacturer's standard, but not less than the following:
 - a. Stiles, Top and Intermediate Rails: 4-1/2 inches.
 - b. Bottom Rails: 9 inches.
 - 8. Molding Profile (Sticking): selected by Architect from manufacturer's full range.
 - 9. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S. 6A and grade specified.

2.6 FIRE-RATED WOOD DOOR FRAMES

- A. Interior Frames:
 - 1. <u>Manufacturers:</u> 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. ASSA ABLOY.
 - b. Eggers Industries.
 - 2. WDMA I.S. 6A Grade: Custom.
 - 3. Wood Species and Cut: Match species and cut indicated for wood doors unless otherwise indicated.
 - 4. Wood Moisture Content: 5 to 10 percent.

- 5. Profile: T-stop.
- 6. Construction: Solid lumber, fire-retardant particleboard, or fire-retardant medium density fiberboard (MDF) with veneered exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Drawings.

2.7 STILE AND RAIL WOOD DOOR FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:
 - Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/2 inch from bottom of door to top of decorative floor finish or covering.
 - c. Where threshold is shown on Drawings or scheduled, provide not more than 3/8 inch from bottom of door to top of threshold.
 - d. Comply with NFPA 80 requirements for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- B. Fabricate stile and rail wood doors in sizes indicated for field fitting.
- C. Factory machine doors for hardware that is not surface applied.
 - 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 - 3. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
 - 4. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- D. Glazed Openings: Trim openings indicated for glazing with solid-wood moldings, with one side removable. Miter wood moldings at corner joints.
- E. Glazed Openings: Factory install glazing in doors, complying with Section 088000 "Glazing." Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C920. Secure glass in place with removable wood moldings. Miter wood moldings at corner joints.
- F. Exterior Doors: Factory treat exterior doors with water-repellent preservative after fabrication has been completed but before shop priming.
 - 1. Comply with WDMA I.S. 4.
 - 2. Flash top of outswinging doors with manufacturer's standard metal flashing.

2.8 FACTORY PRIMING

A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099113 "Exterior Painting." and Section 099123 "Interior Painting."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors and frames] to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated door frames according to NFPA 80.
 - a. Install frames level, plumb, true, and straight.
 - 1) Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
 - b. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - 1) Secure with countersunk, concealed fasteners and blind nailing.
 - Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - c. For shop-finished items, use filler matching finish of items being installed.
 - 2. Install fire-rated doors according to NFPA 80.
 - 3. Install smoke- and draft-control doors according to NFPA 105.

C. Job-Fitted Doors:

- 1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
- 2. Machine doors for hardware.
- 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
- 4. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 3/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown on Drawings or scheduled, provide 3/8 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
- 5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- 6. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory- Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081433

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.
 - b. Sliding doors.
 - c. Folding doors.
 - 2. Cylinders for door hardware specified in other Sections.
 - 3. Electrified door hardware.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 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.
- D. Door hardware schedule.
- E. Keying schedule.

1.3 INFORMATIONAL SUBMITTALS

A. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
 - 1. Scheduling Responsibility: Preparation of door hardware and keying schedule.

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 an Architectural Hardware Consultant (AHC).

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
 - a. Exit Devices: Two years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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 according to 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 according to UL 1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft at the tested pressure differential of 0.3-inch wg 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 to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

2.2 HINGES

- A. Hinges: BHMA A156.1.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. <u>Baldwin Hardware Corporation</u>.
 - b. <u>Hager Companies</u>.
 - c. <u>McKinney Products Company; an ASSA ABLOY Group company.</u>
 - d. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.3 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. Bored Locks: Minimum 1/2-inch latchbolt throw.
- 2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
- 3. Deadbolts: Minimum 1-inch bolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: As included in schedule.
 - 2. Levers: Cast.
 - 3. Escutcheons (Roses): Wrought.
 - 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.
- F. Bored Locks: BHMA A156.2; Grade 1; Series 4000.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
 - b. <u>Hager Companies</u>.
 - c. <u>SARGENT Manufacturing Company; ASSA ABLOY.</u>
 - d. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.4 AUXILIARY LOCKS

- A. Bored Auxiliary Locks: BHMA A156.36: Grade 1; with strike that suits frame.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. <u>Hager Companies</u>.
 - b. <u>SARGENT Manufacturing Company; ASSA ABLOY.</u>
 - c. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.5 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.
 - 1. Core Type: Removable.

2.6 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock.
- B. Keys: Brass.

- 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."

2.7 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. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
 - b. Hager Companies.
 - c. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.8 CLOSER HOLDER RELEASE DEVICES

- A. Closer Holder Release Devices: BHMA A156.15; Grade 1; closer connected with separate or integral releasing and fireor smoke-detecting devices. Door shall become self-closing on interruption of signal to release device. Automatic release is activated by smoke detection system or loss of power.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. <u>Corbin Russwin, Inc.; an ASSA ABLOY Group company.</u>
 - b. <u>SARGENT Manufacturing Company</u>; ASSA ABLOY.
 - c. <u>Stanley Commercial Hardware; a division of Stanley Security Solutions.</u>

2.9 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16.
 - 1. < Double click here to find, evaluate, and insert list of manufacturers and products. >

2.10 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.

2.11 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.

2.12 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.

- B. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg, as follows:
 - 1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
 - 2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
 - 3. Gasketing on Double Doors: 0.50 cfm per foot of door opening.

2.13 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

2.14 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

PART 3 - EXECUTION

3.1 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.
 - 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.
- 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 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
- 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.
- F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- G. 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.
- H. 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.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.2 ADJUSTING

A. 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.

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Glass products.
- Laminated glass.
- 3. Insulating glass.
- 4. Glazing sealants.
- 5. Glazing tapes.
- 6. Miscellaneous glazing materials.

1.2 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass.
- B. Sample warranties.

1.5 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for 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 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 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 - 1. U-Factors: Center-of-glazing values, in accordance with NFRC 100 and based on LBL's WINDOW 7 computer program, expressed as Btu/sq. ft. x h x deg F.
 - 2. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on LBL's WINDOW 7 computer program.
 - 3. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

2.2 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. NGA Publications: "Glazing Manual."
 - 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 - 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 - 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.3 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- B. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- C. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.
 - 1. <u>Manufacturers:</u> 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. <u>Cardinal Glass Industries</u>.
 - b. <u>Guardian Glass; SunGuard</u>.
 - c. Pilkington North America.
 - d. Viracon, Inc.

2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - 2. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.5 GLAZING SEALANTS

A. General:

- 1. Compatibility: Compatible with one another and with other materials they 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.

PART 3 - EXECUTION

3.1 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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. 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.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
- G. 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 in accordance with requirements in referenced glazing publications.

3.2 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. 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.
 - 1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

3.3 MONOLITHIC GLASS SCHEDULE

- A. Ultraclear Glass Type at new Storm Windows and to replace broken glass in existing historic window sashes to be restored: Fully tempered float glass.
 - 1. Minimum Thickness: 6 mm.
 - 2. Safety glazing required.

3.4 INSULATING GLASS SCHEDULE

- A. Clear Insulating Glass Type at new entry door only:
 - 1. Overall Unit Thickness: 5/8 inch.
 - 2. Minimum Thickness of Each Glass Lite: 3 mm.
 - 3. Outdoor Lite: Fully tempered float glass.
 - 4. Interspace Content: Argon.
 - 5. Indoor Lite: Fully tempered float glass.
 - 6. Safety glazing required.

END OF SECTION 088000

SECTION 090320 - HISTORIC TREATMENT OF PLASTER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Repair and replacement of historic interior lime plaster.
 - 2.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of plaster.
 - 2. Review methods and procedures related to historic treatment of plaster and fire protection.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

1.4 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic plastering specialist with expertise in matching and performing the types of historic plasterwork repairs required. Experience only in installing and repairing new plasterwork, veneer plaster, or gypsum board is insufficient experience for historic treatment work.
- B. Mockups: Prepare mockups of historic treatment processes for each type of plaster repair and reconstruction work to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation.
 - 1. Number and Size: Two wall surfaces of at least 40 sq. ft or approximately 48 inches in least dimension to represent surfaces and conditions for application of each type of plaster repair and reconstruction under same conditions as the completed Work. Include at least the following:
 - a. Repair 3 linear ft of plaster cracks.

PART 2 - PRODUCTS

2.1 LIME-PLASTER MATERIALS

- A. Hydrated Lime: ASTM C 206, Type S or Type N.
- B. Lime Putty: Slaked hydrated lime or factory-prepared lime putty according to ASTM C 1489.
- C. Sand Aggregates: ASTM C 897.
- D. Fiber: 1/2 to 1 inch in length; composed of alkali-resistant glass or polypropylene fiber; free of grease, waxes, and oils; and beaten well to separate fibers before blending into unfibered plaster material.
 - 1. Proportion of Fiber to Unfibered Plaster Material: 3.5 oz./cu. ft. of unfibered plaster material, adjusted as required to produce a well-fibered, cohesive, spreadable, stiff mix with fibers uniformly distributed.

2.2 GYPSUM PLASTER MATERIALS

A. Gypsum Materials:

- 1. Lightweight Gypsum Ready-Mixed Plaster: ASTM C 28/C 28M, with mill-mixed perlite aggregate.
- 2. Gypsum Neat Plaster: ASTM C 28/C 28M for use with job-mixed aggregates.
- 3. Gypsum Wood-Fibered Plaster: ASTM C 28/C 28M.
- 4. High-Strength Gypsum Neat Plaster: ASTM C 28/C 28M; with a minimum, average, dry compressive strength of 2800 psi per ASTM C 472 for a mix of 100 lb of plaster and 2 cu. ft. of sand.
- 5. Gypsum Gaging Plaster. ASTM C 28/C 28M.
- 6. High-Strength Gypsum Gaging Plaster: ASTM C 28/C 28M; with a minimum, average, dry compressive strength of 5000 psi per ASTM C 472 for a neat mix.
- 7. Gypsum Ready-Mixed Finish Plaster: ASTM C 28/C 28M; manufacturer's standard, mill-mixed, gaged, interior finish.
- 8. Gypsum Keene's Cement: ASTM C 61/C 61M.
- B. Hydrated Lime: ASTM C 206, Type S or Type N.

C. Aggregates:

- 1. Aggregate for Base-Coat Plasters: ASTM C 35, sand.
- 2. Aggregate for Float Finishes: ASTM C 35, sand; graded per ASTM C 842.
- D. Fiber: 1/2 to 1 inch in length; composed of glass or polypropylene fiber; free of grease, waxes, and oils; and beaten well to separate fibers before blending into unfibered plaster material.
 - 1. Proportion of Fiber to Unfibered Plaster Material: 3.5 oz./cu. ft. of unfibered plaster material, adjusted as required to produce a well-fibered, cohesive, spreadable, stiff mix with fibers uniformly distributed.
- E. Bonding Compound: ASTM C 631.

2.3 LATH

A. Wood Lath: 1/4 inch by 1-1/4 inch sound, straight-grained, wood strips.

B. Metal Lath:

- 1. Expanded-Metal Lath: ASTM C 847, cold-rolled carbon-steel sheet, ASTM A 653/A 653M, G60, hot-dip galvanized zinc coated.
 - a. Diamond-Mesh Lath: Flat, 2.5 lb/sq. yd..

2.4 TRIM ACCESSORIES

A. General: According to ASTM C 1063 for lime plaster and ASTM C 841 for gypsum plaster; coordinate depth of trim and accessories with thicknesses and number of plaster coats required.

B. Metal Accessories:

- 1. Cornerite: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
- 2. Striplath: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
- 3. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
- 4. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
- 5. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

2.5 MISCELLANEOUS MATERIALS

- A. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Fasteners for Attaching Lath to Substrates:
 - 1. For Lime Plaster: ASTM C 1063.
 - 2. For Gypsum Plaster: ASTM C 841.
 - 3. For Wood Lath: ASTM C 841 requirements for wood-floor-runner or wood-furring fasteners unless otherwise indicated on Drawings.
- C. Wire Ties: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475-inch diameter, unless otherwise indicated.

PART 3 - EXECUTION

3.1 HISTORIC TREATMENT OF PLASTER, GENERAL

- A. General: In treating historic plaster, disturb it as minimally as possible and as follows unless otherwise indicated:
 - 1. Dismantle loose, damaged, or deteriorated plaster, lath, and support systems that cannot be repaired.
 - 2. Verify that substrate surface conditions are suitable for repairs.
 - 3. Provide lath, furring, and support systems for plaster included in the work of this Section.
 - 4. Leave repaired plasterwork in proper condition for painting or applying other finishes as indicated.
 - 5. Install temporary protective measures to protect historic surfaces that shall be treated later.

B. Illumination: Perform plastering work with adequate, uniform illumination that does not distort the flatness or curvature of surfaces.

3.2 PLASTER REMOVAL AND REPLACEMENT, GENERAL

- A. Dismantle plaster that is damaged or deteriorated to the limits indicated. Carefully dismantle areas along straight edges that lie over supports, without damaging surrounding plasterwork.
- B. Maintain lath and supporting members in an undamaged condition so far as practicable. Dismantle damaged lath and supports that cannot be repaired or resecured and replace with new work of same type.
- C. Do not deviate more than plus or minus 1/8 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
- D. Clean substrate surfaces to remove grease, waxes, oils, waterborne staining, debris, and other foreign matter and deposits that could impair bond with repair material.
- E. Wet wood lath and masonry bases before plaster application. Keep substrate damp to the touch but without visible water droplets.
- F. Wet remaining plaster abutting the replacement plaster before installing new plasterwork.
- G. Provide plaster surfaces that are ready to receive field-applied finishes indicated.

3.3 FLAT LIME-PLASTER REMOVAL AND REPLACEMENT

- A. General: Dismantle deteriorated plaster to existing sound plaster as required by existing integrity.
- B. Lime-Plaster Base Coats:
 - 1. Scratch Coat: 1 part lime putty, 2-1/2 parts base-coat sand, and fiber. Add hair fiber to mix and evenly distribute it without clumps just before spreading.
 - 2. Brown Coat: 1 part lime putty, 3 parts base-coat sand.
- C. Lime-Plaster Finish Coats:
 - 1. Finish-Coat Mix for Smooth-Float Finish: As required to match finish of adjacent surfaces that are existing to-remain.
- D. Lime-Plaster Finishes: [Match finish(es) of design reference sample(s)] < Insert requirement > .
 - 1. Provide smooth-float finish unless otherwise indicated. Apply in one layer totaling 1/8 inch thick.
- E. Hairline cracking within the plaster or plaster separation at edge of a replacement is unacceptable. Completely dismantle such work and reinstall or repair as a crack repair.

3.4 FLAT GYPSUM-PLASTER REMOVAL AND REPLACEMENT

- A. General: Dismantle deteriorated plaster to existing sound plaster. Use replacement plaster mixes of gypsum, lime, and aggregate; and application according to ASTM C 842 unless otherwise indicated.
- B. Bonding Compound: Apply on unit masonry plaster bases.

- C. Gypsum-Plaster Base Coats:
 - 1. Base Coats over Wood Lath: Gypsum lightweight ready-mixed plaster with fiber.
 - 2. Base Coats over Unit Masonry: Gypsum lightweight ready-mixed plaster.
- D. Gypsum-Plaster Finish Coats:
 - 1. Finish-Coat Mix for Float Finishes: Gypsum gaging plaster.
- E. Gypsum-Plaster Finishes: Match finish of adjacent existing surfaces to-remain.
 - 1. Provide float finish unless otherwise indicated.

3.5 REMOVING AND INSTALLING LATH AND ACCESSORIES

- A. General: Dismantle existing plaster as necessary to expose deteriorated or rusted lath, wire ties, and support system, back to firm substrates and supports. Repair with new materials, well secured to existing lath in good condition and to building structure.
 - 1. Cutting: Cut lath so it can be taken out completely from one support to the next. Cut to avoid cracking surrounding plaster.
 - 2. Cut out existing base-coat plaster beyond the edges of the new lath to permit new plaster to extend onto the old lath. Then step subsequent plaster coats to permit new plaster to extend over the old material.
 - 3. Fasten new lath to support system and to good existing lath. Wire tie at least every 6 inches.
 - 4. Install new lath according to ASTM C 1063 for lime plaster and ASTM C 841 for gypsum plaster.
- B. Wood Lath: Install wood lath in same orientation and spacing as remaining wood lath and with lath ends supported by furring or framing. Stagger ends of adjacent laths over different supports, not aligned, and secure with fasteners at each end and spaced a maximum of 24 inches o.c. into supports.
- C. Metal Lath: Install according to ASTM C 1063 for lime plaster and ASTM C 841 for gypsum plaster.

3.6 PATCH-TYPE REPAIR

- A. General: Patch voids, fractured surfaces, and crushed areas in otherwise sound plaster that are larger than cracks where integrity warrants.
 - 1. Inspect for deterioration of supporting plaster and lath, and repair or replace deteriorated material as required for a sound substrate.
 - 2. Rake perimeter of hole to sound plaster, and slightly undercut existing plaster to enable replacement plaster to tuck behind existing plaster.
 - 3. Replace missing lath in kind. Bridge gaps in wood lath with expanded-metal lath, overlapping wood by 6 inches and fastening them together.
 - 4. Clean hole to remove loose materials and other foreign matter and deposits that could impair bond with repair material.
 - 5. Wet substrate to damp condition, but without visible water droplets, then install patch material to original profiles.
- B. Lime-Plaster Mix: Repair mix demonstrated in mockup. Add fiber to mix and evenly distribute it without clumps just before spreading.
- C. Gypsum-Plaster Mix: Gypsum gaging plaster. Add fiber to mix and evenly distribute it without clumps just before spreading.]

- D. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the shape edges and the shape of the molded shape to original contours.
- E. Hairline cracking within the plaster or plaster separation at edge of a patch is unacceptable. Completely dismantle such work and reinstall or repair.

3.7 HAIRLINE CRACK REPAIR

- A. General: Repair cracks 1/16 inch in width or narrower in otherwise sound plaster.
- B. Existing Topcoat: Open crack in existing topcoat to at least 1/8 inch in width and check for broken fiber reinforcement in base coats.
- C. Existing Base Coats: Do not open crack wider in existing base coats unless inspection or other indication shows that the fiber reinforcement has broken. Where inspections indicate failure of fiber reinforcement, proceed as for a large crack repair, but only for length of crack with broken fiber reinforcement.
- D. Clean out crack to remove loose materials and other foreign matter and deposits that could impair bond with repair material.
- E. Wet substrate to damp condition, but without visible water droplets.
- F. Force repair material demonstrated in mockup into crack, filling crack to original plaster profile.
- G. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.

3.8 LARGE CRACK REPAIR

- A. General: Repair cracks over 1/16 inch in width in otherwise sound plaster.
- B. Open crack to at least 1/8 inch in width and full depth with V-groove tool, and check for bond separation or lath deterioration.
- C. Abrade side surfaces of crack and remove inner crack debris by gouging (keying) the inside area of the crack.
- D. Clean out crack to remove loose materials and other foreign matter and deposits that could impair bond with repair material.
- E. Wet substrate to damp condition, but without visible water droplets.
- F. Install [finish-coat plaster] [repair material demonstrated in mockup] < Insert requirement > to fill crack to original plaster profile.
- G. Finishing: Finish flat surfaces flush and with same texture as adjacent existing plaster. For molded plaster shapes, tool surface to restore the sharp edges and the shape of the molded shape to original contours.

END OF SECTION 090320

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Interior gypsum board.
- 2. Tile backing panels.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Gypsum board, Type X.
 - 2. Mold-resistant gypsum board.
 - 3. Cementitious backer units.
 - 4. Interior trim.
 - 5. Joint treatment materials.
 - 6. Sound-attenuation blankets.
 - 7. Acoustical sealant.
- B. Samples: For each texture finish indicated on same backing indicated for Work.

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 E119 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 E90 and classified according to ASTM E413 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.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C1396/C1396M.
 - 1. <u>Manufacturers:</u> 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. <u>American Gypsum</u>.
- b. CertainTeed Gypsum.
- c. Georgia-Pacific Gypsum LLC.
- d. <u>USG Corporation</u>.
- 2. Thickness: 5/8 inch.
- 3. Long Edges: Tapered.
- B. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. <u>Manufacturers:</u> 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. American Gypsum.
 - b. <u>CertainTeed Gypsum</u>.
 - c. <u>Georgia-Pacific Gypsum LLC</u>.
 - d. <u>USG Corporation</u>.
 - 2. Core: 5/8 inch, Type X.
 - 3. Long Edges: Tapered.
 - 4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C1178/C1178M, with manufacturer's standard edges.
 - 1. <u>Manufacturers:</u> 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. CertainTeed Corporation.
 - b. <u>Georgia-Pacific Gypsum LLC</u>.
 - c. <u>National Gypsum Company</u>.
 - d. <u>USG Corporation</u>.
 - 2. Core: 5/8 inch, Type X.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
- B. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
 - 1. <u>Manufacturers:</u> 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. CertainTeed Corporation.
 - b. <u>National Gypsum Company</u>.
 - c. <u>USG Corporation</u>.
 - 2. Thickness: 5/8 inch.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

- 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel.
- 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Exterior Gypsum Soffit Board: Paper.
 - 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 - 4. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
 - 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
 - 2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 - 1. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C665, 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.
- E. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 INSTALLATION AND FINISHING OF PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C840.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- E. Prefill open joints, and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for tile.
 - 3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- H. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- I. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.
- J. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.2 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Ceramic mosaic tile.
- Porcelain tile.
- Glazed wall tile.
- 4. Stone thresholds.
- 5. Tile backing panels.
- 6. Waterproof membrane [for thinset applications].
- 7. Crack isolation membrane.
- 8. Metal edge strips.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

- 1. Each type and composition of tile and for each color and finish required. [For ceramic mosaic tile in color blend patterns, provide samples of each color blend.]
- 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required.
- 3. Stone thresholds.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Avitru. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

2.1 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

- A. Ceramic Tile Type Factory-mounted unglazed ceramic mosaic tile.
 - 1. <u>Manufacturers:</u> Subject to compliance with requirements, provide products by one of the following:
 - a. American Marazzi Tile, Inc.
 - b. American Olean; a division of Dal-Tile Corporation.
 - c. <u>Crossville, Inc</u>.
 - 2. Composition: Impervious natural clay or porcelain.
 - 3. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
 - 4. Module Size: 1 by 1 inch.
 - 5. Thickness: 1/4 inch.
 - 6. Face: Plain with cushion edges.
 - 7. Surface: Slip resistant, with abrasive admixture.
 - 8. Dynamic Coefficient of Friction: Not less than 0.42.
 - 9. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
 - 10. Grout Color: As selected by Architect from manufacturer's full range
 - 11. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cove: Cove, module size 1 by 1 inch.
 - b. External Corners for Thinset Mortar Installations: Surface bullnose, module size 1 by 1 inch.
 - c. Internal Corners: Cove, module size 1 by 1 inch.
 - d.
- B. Ceramic Tile Type Glazed wall tile.
 - 1. <u>Manufacturers:</u> 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. American Marazzi Tile, Inc.
 - b. <u>American Olean; a division of Dal-Tile Corporation</u>.
 - c. Daltile.
 - 2. Module Size: 4-1/4 by 4-1/4 inches.
 - 3. Thickness: 5/16 inch.
 - 4. Face: Plain with modified square edges or cushion edges].
 - 5. Finish: Bright, opaque glaze.
 - 6. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
 - 7. Grout Color: As selected by Architect from manufacturer's full range >.
 - 8. Mounting: Factory, back mounted.
 - 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

- a. Base: Straight module size 4-1/4 by 4-1/4 inches.
- b. External Corners: Bullnose, same size as adjoining flat tile.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 10 according to ASTM C1353 or ASTM C241/C241M and with honed finish.
 - 1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.4 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.5 CRACK ISOLATION MEMBRANE

A. General: Manufacturer's standard product, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

2.6 SETTING MATERIALS

- A. Improved Modified Dry-Set Mortar (Thinset): ANSI A118.15.
 - 1. <u>Manufacturers:</u> 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. ARDEX Americas.
 - b. LATICRETE SUPERCAP, LLC.
 - c. MAPEI Corporation.
 - 2. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
 - 3. For wall applications, provide nonsagging mortar.

2.7 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
 - 1. <u>Manufacturers:</u> 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. ARDEX Americas.
 - b. <u>LATICRETE SUPERCAP, LLC</u>.

- c. MAPEI Corporation.
- 2. Polymer Type: Dry. redispersible form, prepackaged with other dry ingredients.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Blanke Corporation.
 - b. Ceramic Tool Company, Inc.
 - c. Schluter Systems L.P.
- C. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.
 - 1. <u>Manufacturers:</u> 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. Bonsal American, an Oldcastle company.
 - b. Custom Building Products.
 - c. Jamo Inc.
 - d. Southern Grouts & Mortars, Inc.
 - e. <u>Summitville Tiles, Inc</u>.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with adhesives bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

- B. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch.
 - 2. Glazed Wall Tile: 1/16 inch.
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in improved modified dry-set mortar (thinset).
 - 2. Do not extend waterproof membrane or crack isolation membrane under thresholds set in improved modified dry-set mortar. Fill joints between such thresholds and adjoining tile set on waterproof membrane or crack isolation membrane with elastomeric sealant.
- I. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated.
- J. Install tile backing panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- K. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.

L. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Wood Subfloor:
 - 1. Ceramic Tile Installation TCNA F144; thinset mortar on waterproof membrane over cementitious backer units or fiber-cement backer board.
 - a. Ceramic Tile Type: Mosaic floor tile.
 - b. Thinset Mortar: Improved modified dry-set mortar.
 - c. Grout: High-performance unsanded grout.
- B. Interior Wall Installations, Wood or Metal Studs or Furring:
 - 1. Ceramic Tile Installation: TCNA W245 or TCNA W248; thinset mortar on glass-mat, water-resistant gypsum backer board.
 - a. Ceramic Tile Type: Glazed ceramic wall tile.
 - b. Thinset Mortar: Improved modified dry-set mortar.
 - c. Grout: High-performance unsanded grout.

SECTION 099113 - FXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates, including the following.
 - Steel and iron.
 - 2. Wood.
 - 3. Portland cement plaster (stucco).

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Sustainable Design Submittals:
- C. Samples: For each type of paint system and each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

- A. 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.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft...
 - b. Other Items: Architect will designate items or areas required.

- 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. <u>Manufacturers:</u> Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - PPG Paints.
 - 2. Sherwin-Williams Company (The).
 - 3. <u>Valspar Corporation (The)</u>.
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: Match Architect's samples.
 - 1. Thirty percent of surface area will be painted with deep tones.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.

- 5. Portland Cement Plaster: 12 percent.
- 6. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Steel and Iron Substrates:
 - 1. Water-Based Light Industrial Coating System MPI EXT 5.1C:
 - a. Prime Coat: Primer, alkyd, anti-corrosive for metal, MPI #79.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based, gloss (MPI Gloss Level 6), MPI #164.
- B. Wood Substrates: Wood trim, Architectural woodwork, Doors, and Windows.
 - 1. Latex System MPI EXT 6.3A:

- a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates, including the following:
 - 1. Steel and iron.
 - Galvanized metal.
 - 3. Wood.
 - 4. Gypsum board.
 - 5. Plaster.
 - 6.

1.2 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
- B. Sustainable Design Submittals:
 - 1. < Double click to insert sustainable design text for paints and coatings. >
- C. Samples: For each type of paint system and in each color and gloss of topcoat.

1.4 QUALITY ASSURANCE

- A. 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.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft...
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. <u>Manufacturers:</u> Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Paints.
 - 3. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: Match Architect's samples.
 - 1. Thirty percent of surface area will be painted with deep tones.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Wood: 15 percent.
 - 2. Gypsum Board: 12 percent.
 - 3. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 INTERIOR PAINTING SCHEDULE

- A. Galvanized-Metal Substrates:
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 5.3N:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 2), MPI #144.

- B. Wood Substrates: Wood trim, Architectural woodwork, Doors, and Windows.
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 6.3V:
 - a. Prime Coat: Primer, latex, for interior wood, MPI #39.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3), MPI #145.
- C. Wood Substrates: Traffic surfaces, including floors and stairs.
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 6.8F:
 - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (MPI Gloss Level 5), MPI #147.
- D. Gypsum Board and Plaster Substrates:
 - 1. Institutional Low-Odor/VOC Latex System MPI INT 9.2M:
 - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
 - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
 - c. Topcoat: Latex, interior, institutional low odor/VOC (MPI Gloss Level 3), MPI #145.

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

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. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

- 1. <u>Manufacturers:</u> 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. <u>Amerex Corporation</u>.
 - b. <u>Ansul by Johnson Controls Company.</u>
 - c. Guardian Fire Equipment, Inc.
 - d. Kidde Residential and Commercial Division.
 - e. Larsens Manufacturing Company.
 - f. Pyro-Chem; Tyco Fire Suppression & Building Products.
- 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type FE-1: UL-rated 10-pound nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: Top of fire extinguisher to be at 42 inches above finished floor.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

SECTION 123530 - RESIDENTIAL CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes kitchen and vanity cabinets.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For residential casework. Include plans, elevations, details, and attachments to other work.
- C. Samples: For casework and hardware finishes.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For casework.

PART 2 - PRODUCTS

2.1 CABINETS

- A. Quality Standard: Provide cabinets that comply with KCMA A161.1.
 - 1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with KCMA A161.1.
- B. Door and Drawer Face Style: Reveal overlay.
 - 1. Door and Drawer Fronts: Solid-wood stiles and rails, 3/4 inch thick, with 1/4-inch-thick, veneer-faced plywood center panels.
- C. Cabinet Style: Face frame.
 - 1. Face Frames: 3/4-by-1-5/8-inch solid wood with glued mortise and tenon or doweled joints.
- D. Exposed Cabinet End Finish: Wood veneer.

2.2 CABINET MATERIALS

- A. Hardwood Lumber: Kiln dried to 7 percent moisture content.
- B. Softwood Lumber: Kiln dried to 10 percent moisture content.
- C. Hardwood Plywood: HPVA HP-1.

D. Exposed Materials:

- 1. Exposed Wood Species: Manufacturer's standard domestic hardwood species.
 - a. Select materials for compatible color and grain. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings.
 - b. Staining and Finish: As selected by Architect from manufacturer's full range.
- 2. Solid Wood: Clear hardwood lumber of species indicated, free of defects.
- 3. Plywood: Hardwood plywood with face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.
 - a. Edge band exposed edges with veneer edging of same species as face veneer.
- E. Semiexposed Materials: Unless otherwise indicated, provide the following:
 - 1. Plywood: Hardwood plywood with Grade C faces and not less than Grade 3 backs of same species as faces. Face veneers of same species as exposed surfaces.

2.3 CABINET HARDWARE

- A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish selected by Architect from manufacturer's full range.
- B. Pulls: back-mounted decorative pulls with backing plates.
- C. Hinges: Concealed European-style, self-closing hinges.
- D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or Type B05091.
- E. Door and Drawer Bumpers: Self-adhering, clear silicone rubber.
 - 1. Doors: Provide one bumper at top and bottom of closing edge of each swinging door.
 - 2. Drawers: Provide one bumper on back side of drawer front at each corner.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install casework with no variations in adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework.
- B. Install casework without distortion so doors and drawers fit the openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.
- C. Install casework level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten casework to adjacent units and to backing.
 - 1. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c.

- a. Fasteners: No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips
- E. Adjust hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- F. Clean casework on exposed and semiexposed surfaces. Touch up as required to restore damaged or soiled areas to match original factory finish, as approved by Architect.

SECTION 123661.19 - QUARTZ AGGI OMERATE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

- 1. Quartz agglomerate countertops.
- 2. Quartz agglomerate backsplashes.
- 3. Quartz agglomerate end splashes.
- 4. Quartz agglomerate apron fronts.

1.2 ACTION SUBMITTALS

- A. Product Data: For countertop materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 QUARTZ AGGLOMERATE COUNTERTOP MATERIALS

- A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with ICPA SS-1, except for composition.
 - 1. <u>Manufacturers:</u> 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. <u>E. I. du Pont de Nemours and Company</u>.
 - b. <u>Samsung Chemical USA, Inc</u>.
 - c. Technistone USA, Inc.
 - d. Wilsonart LLC.
 - 2. Colors and Patterns: As selected by Architect from manufacturer's full range.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to quartz agglomerate manufacturer's written instructions and the AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Grade: Custom.

B. Configuration:

- 1. Front: 1-1/2-inch laminated straight, slightly eased edge.
- 2. Backsplash: Straight, slightly eased at corner.
- 3. End Splash: Matching backsplash.
- C. Countertops: 3/4-inch-thick, quartz agglomerate with front edge built up with same material].
- D. Backsplashes: 3/4-inch-thick, quartz agglomerate.
- E. Joints: Fabricate countertops without joints.
- F. Cutouts and Holes:
 - 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

2.3 INSTALLATION MATERIALS

- A. Adhesive: Product recommended by quartz agglomerate manufacturer.
- B. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer.
- B. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- C. Secure countertops to subtops with adhesive according to quartz agglomerate manufacturer's written instructions.
- D. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
- E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive.
- F. Install aprons to backing and countertops with adhesive.
- G. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- H. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.19

SECTION 220050

BASIC PLUMBING REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Plumbing Requirements specifically applicable to Mechanical Division Specification Sections.
- B. Division 22 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

1.02 OWNER OCCUPANCY

- A. The owner will occupy the premises during the construction period.
- B. Limit use of site and premises to allow owner occupancy.
- C. Cooperate with the owner to minimize conflict and to facilitate owner's operations.
- D. Schedule the work to accommodate this requirement.

1.03 REGULATORY REQUIREMENTS

- A. This contractor shall give proper authorities all requisite notices relating to work in his charge, obtain official permits, licenses for temporary construction and pay proper fees for it.
- B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by himself, by his employees or through any operation under his charge, whether in the contract or extra work.
- C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.
- D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.
- E. All work shall comply with the applicable recommendations of:
 - 1. The National Board of Fire Underwriters
 - 2. The American Gas Association
 - 3. The National Fire Protection Association (NFPA)
 - 4. The Occupations Safety and Health Act (OSHA)
 - 5. Current IBC Building Code
 - 6. Current applicable city building codes.
- F. Mechanical: Conform to current mechanical code.
- G. Plumbing: Conform to current plumbing code.
- H. Obtain permits and request inspections from authority having jurisdiction.
- I. Safe Drinking Water Act and Senate Bill S.3874: All products must meet the lead-free requirements of the SDWA and NSF/ANSI 372 certification.

1.04 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on the drawings unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.
- C. This contractor, before submitting his bid, shall visit the site of the project to familiarize himself with locations and conditions affecting his work.

- D. It is the intent of this specification that the contractor furnishes all labor and material required completing the installation as outlined in the drawings and specifications. No additions to the contract price shall be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.
- E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing piping, ductwork, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.
- F. This contractor shall provide holes as necessary for the installation of his work and in accordance with other specification sections in materials other than the structure.

1.05 SEQUENCING AND SCHEDULING

- A. This contractor shall arrange his work in order that it progresses along with the general construction of the building.
- B. This contractor shall be kept informed as to the work of other trades engaged in the project and shall execute his work in such a manner so as not to delay or interfere with progress of other contractors.
- C. Where space for mechanical and electrical lines and piping is limited, it is imperative that all such trades coordinate their work so as to insure concealment in space provided. Where conflict exists, the engineer shall decide priority of space. If work is not properly coordinated, the engineer may require removal and relocation of work without additional compensation.

1.06 GUARANTEE

- A. This contractor shall guarantee all of the apparatus, materials, equipment furnished and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.
- B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.
- C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at his own expense.

1.07 ENGINEER APPROVED EQUAL PRODUCTS

- A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.
- B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.
- C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".
- D. Similar products shall be all of the same manufacturers and style. There is no exception to this unless prior approval has been granted from engineer.

1.08 OWNER'S RIGHT OF SALVAGE

A. Before beginning construction, this contractor shall check and verify with the owner each item of existing equipment that must be removed.

- B. The owner will designate which items of material or equipment not reused that he may wish to keep. This contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.
- C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for his use shall become the property of the contractor and shall be removed from site.

1.09 PROTECTION AND MAINTENANCE

- A. Where necessary to connect to any existing utility service, this contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.
- B. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.
- C. This contractor shall protect existing equipment in finished areas from dirt, dust and damage as a result of his work.
- D. Coordinate protection requirements with department heads before beginning construction.
- E. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.10 DEMOLITION

- A. This contractor shall be responsible for the demolition and removal of all existing mechanical elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be relocated".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
 - 4. All elements to be removed are subject to the Owner's Right of Salvage.
- B. Preserve services to the existing facility. Extend/reroute/reconnect existing systems as required providing for the continued function of these systems.

1.11 CUTTING AND PATCHING

- A. This contractor shall do all cutting and patching necessary for the installation of his work in all existing and new buildings unless otherwise noted.
- B. This contractor shall arrange for openings in the building as required for the installation of equipment furnished under this contract.
- C. Where sewers must be extended or changed, patching with concrete will be done in the building. Patching shall be at both the top and bottom of sleeves where above grade.
- D. In areas where the integrity of new or existing fire separation assembly/wall is compromised by the work, contractor shall be responsible to patch and/or seal openings as necessary to maintain/return fire separation to rating as required by applicable codes.
- E. This contractor shall do all cutting and patching required for his work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.12 CLEANING AND RUBBISH

- A. This contractor shall upon completion of his work, remove all rubbish and debris resulting from his operation and shall remove it from site at his own expense.
- B. In so far as his work is concerned, all equipment shall be cleaned and the premises left in first class condition.
- C. This contractor shall maintain the work area each day to prevent hazardous accumulation of waste from his work.

1.13 SEALING AND PENETRATION

- A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.
- B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.
- C. Manufacturer offering products to comply with the requirements include the following:
 - 1. Dow Corning "Silicone RTV Foam"
 - 2. 3-M Corporation "Fire Barrier Caulk and Putty"
 - 3. Thomas & Betts "Flame Safe Fire Stop System"
- D. Installation of these products to be in strict accordance with manufacturer's recommendations and architectural specification sections or equivalent fire stopping architectural specification section.
- E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.14 ELECTRICAL CONNECTIONS

A. This contractor shall turn over all magnetic starters, thermal protective switches and speed changing switches furnished under this contract for all motor driven equipment to the electrical contractor who will install such starters and switches and wire them to their respective motors as a part of the electrical contract.

1.15 UTILITY COMPANY

- A. Any fees by the utility company are to be billed directly to the owner.
- B. The contractor is required to assist the owner in the preparation of all utility company rebate forms that deal with equipment furnished and/or installed as a part of this contractor.

1.16 HAZARDOUS MATERIALS

- A. If the contractor stores any hazardous solvents or other materials on the site, he shall obtain copies of the safety data sheets for the materials and post them on the site. He shall inform the owner and all employed of any potential exposure to this material.
- B. At no time shall any product containing asbestos be incorporated into the work.
 - 1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.17 RECORD DRAWINGS

- A. This contractor shall provide, at the conclusion of the project, one clean, non-torn, neat, and legible "as-built" set of drawings to the owner. These drawings shall show the routing of pipes, ductwork and equipment drawn in at scaled locations. All dimensions indicated shall be referenced to a column line. A set of construction blue prints will be furnished for this work.
- B. All mechanical systems installed shall be shown on the "as-built" drawings.
- C. Refer to respective architectural specification section for additional information.
- D. This contractor shall update these drawings during the project at least every week.

1.18 REVIEW OF MATERIALS

- A. This contractor shall submit to the engineer for review one (1) electronic copy of a brochure giving a complete list of materials and equipment he proposes to furnish. The brochure shall contain complete information as to the make of equipment, type, size, capacities, dimensions and illustration. One of the returned copies shall be kept on the job at all times.
- B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless he notifies engineer in writing of such deviation at time such drawings are furnished.

- C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.
- D. This contractor shall mark the date and sign each set that he has checked each of them in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted, or checked and will be marked "resubmit" and sent back to the contractor.

1.19 TEST OF SYSTEMS

- A. This contractor shall, before concealed, test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.
- B. This contractor shall be held responsible for all damage resulting from defects in the system.
- C. At the conclusion of construction (before any covering up, painting or finishing) each element of the system shall be thoroughly tested against leakage with appropriate pressure tests as outlined herein and in appropriate sections of the specifications. All testing shall be hydrostatic unless permission is granted otherwise.
 - 1. Water: 100 psi maintained 8 hours
 - 2. Under Floor Pipes: 200 psi maintained 8 hours in accordance with NFPA13
 - 3. Sanitary Sewer: 10 foot hydrostatic
 - 4. Storm Sewer: 10 foot hydrostatic
- D. Fluid lines other than the above 1.5 times operating with a minimum pressure of 60 psig.
- E. No covering or backfilling of sewer lines shall be done until inspected by the architect or local inspector. Test T's shall be provided on all waste and vent stacks 4'-6" above each floor as required for testing the plumbing system.
- F. After completion of installation, the systems shall be given tests under full operating conditions and pressures and all adjustments shall be made to make the system operative as required. All safety devices shall be tested for correct operation.

1.20 SCOPE OF WORK

- A. All work shall be performed by well-qualified and licensed mechanics with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that his mechanics are familiar with all the various codes and tests applicable to this work.
- B. All equipment shall be new and of the type as specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.
- C. The intent of the drawings and specifications is for complete installation of the systems outlined in the drawings and specifications so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation.
- D. This contractor shall be required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type. The drawings and specifications cannot deal individually with the many minute items that may be required by the nature of the systems.
- E. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer's attention and an addendum is issued for clarification.

1.21 VERIFICATION OF ELEVATION OF EXISTING LINES

A. This contractor, before starting any new work, shall verify the elevations of all existing piping to which he must connect under this contract. He shall report any discrepancies between drawing

elevations and actual elevations to the engineer before proceeding with the work. Failure of the contractor to do so shall make him liable for the cost of extra work involved.

1.22 DAILY HOUSEKEEPING

- A. At the end of each working day, this contractor shall remove all of his debris, rubbish, tools and surplus materials from the project work area. The work area shall be broom clean and left in a neat and orderly condition. The contractor for the removal of debris from the project shall not use the owner's waste disposal facility.
- B. At end of construction, all equipment shall be cleaned and the premises left in first class condition as far as this contractor's work is concerned.

1.23 OWNER'S RIGHT OF WORK CESSATION

- A. The owner reserves the right to order an immediate cessation of the work without giving advance notice.
- B. All work not directly affecting the owner's use and occupancy of the remodeled/new areas shall be performed between the hours of 7:00 am and 5:00 pm Monday through Friday. Weekend hours shall be as arranged with the owner.
- C. All work directly affecting the owner's use and occupancy of the remodeled/new area shall be performed between the hours of 5:00 pm and 7:00 am Monday through Friday. Weekend hours shall be as arranged with the owner.

1.24 CLEANING OF MECHANICAL SYSTEMS

- A. The mechanical contractor shall clean and passivate all plumbing systems. Flush systems with water until free from all sand, grit, gravel, oil, etc. Provide Babcock/Wilcox Millipore and biological testing on the flush water. The flush will be considered a success when the water exiting the system contains less than 100 ppb of total suspended solids and less than 100 RLUs.
- B. Where connections are made to existing piping systems, this contractor shall provide isolation valves, threaded tees, etc., as required to facilitate the cleaning and testing of all new piping.
- C. This contractor shall thoroughly clean all rust, grease, plaster, cement, etc., from all equipment and piping furnished and installed by him as required to leave surfaces suitable for finish painting.
- D. This contractor shall keep all pipes, traps, waste lines, ducts, etc., plugged, drained or otherwise protected during construction. All items of mechanical equipment shall be suitably protected and upon completion of project shall be equal to new condition.

1.25 TRENCHING AND BACKFILLING

- A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.
- B. All underground utilities, piping, etc shall be located exactly before digging. This contractor shall be held responsible for all damages caused by failure to do so.
- C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.
- D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.
- E. Refer to architectural specification sections for additional requirements.

1.26 ALTERNATES

A. Refer to General Specification Sections for alternate bid description.

1.27 DIGITAL MEDIA AGREEMENT

A. Computer Aided Drafting (CAD) documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.

B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

1.28 COMMISSIONING REQUIREMENTS

- A. Contractor and their subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - 1. Construction Phase:
 - a. Facilitate the coordination of the commissioning and incorporate commissioning activities (the Commissioning Plan) into the Overall Project Schedule (OPS).
 - b. Provide detailed startup procedures.
 - c. Ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents and the OPS.
 - d. Provide copies of all submittals as required in Section 01300 including all changes thereto. Attend and participate in commissioning team meetings.
 - e. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxA, CM, A/E, and PM and owner to finalize the detailed commissioning procedures/ schedule.
 - f. Provide the training of owner personnel.
 - g. Review and accept construction checklists provided by the commissioning authority.
 - h. Complete paper construction checklists as work is completed and provide to the commissioning agent.
 - i. Accomplish commissioning process test procedures.
 - j. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - k. Cooperate with the CxA for resolution of issues recorded in the "Issues Log".
 - I. Prepare O & M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built/as-tested conditions.
 - 2. Occupancy and Operations Phase
 - a. Ensure that subcontractors provide assistance for seasonal or deferred performance testing, performed by the CxA, according to the specifications.
 - b. Ensure that subcontractors correct deficiencies and make necessary adjustments to O & M manuals and as-built drawings for applicable issues identified in any seasonal testing.
 - c. Perform all guarantee work for materials furnished under the contract for the time specified in the contract, including all warranties and curing all latent defects within the time period provided in the contract.

B. Vendors / Subcontractors

- Provide all requested submittal data, including detailed startup procedures and specific responsibilities of the owner to keep warranties in force.
- Assist in equipment testing per agreements with subcontractors and/or contractor.
- 3. Include cost of all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing, operating, and maintaining equipment according to these contract documents in the base bid price to the contractor.
- 4. Analyze specified products and verify that the A/E has specified the newest, most current equipment reasonable for this project's scope and budget.
- Provide requested information regarding equipment sequence of operation and testing procedures.
- 6. Review construction checklists and test procedures for equipment installed by factory representatives.

PART 2 PRODUCTS
NOT USED
PART 3 EXECUTION
NOT USED

SECTION 220090

MINOR PLUMBING DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements of the Contract Forms, the Conditions of the Contract, Division 1 - General Requirements and Specification Section 220050 - Basic Mechanical Requirements "General Provisions" apply to this section.

1.02 SCOPE

- A. This contractor shall be responsible for the demolition and removal of all existing mechanical elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be relocated".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
- B. Preserve services to the existing facility. Extend, reroute, and reconnect existing systems as required providing for the continued function of these systems.
- C. This contractor shall be responsible for the cutting and capping of all existing gas, water, sewer, and any other utility service.
- D. Demolition shall be accomplished by the proper tools and equipment for the work to be removed. Personnel shall be experienced and qualified in the type of work to be performed.
- E. This contractor shall remove all abandon equipment, piping, ductwork, supports, equipment curbs, and bases associated with the remodeled areas unless noted otherwise.
- F. This contractor is responsible to provide temporary plumbing protection during this project.

1.03 MATERIALS

- A. All elements to be removed are subject to the Owner's Right of Salvage.
- B. All materials removed shall be the property of the removing contractor and shall be removed from the site by him, unless otherwise specified.
- C. The owner may designate and have salvage rights to any material herein demolished by this contractor. The contractor shall coordinate with the owner prior to start of demolition.

1.04 WORK BY OTHERS

- A. Unless specifically noted under other contracts, this mechanical contractor shall assume he will perform all required work. In general, the following will be performed by others:
 - 1. The electrical contractor will disconnect all electrical service and remove conduit back to behind finished surfaces, close and cap ends of conduits.

1.05 EXISTING CONDITIONS

- A. If any piping serving existing fixtures or equipment (that are to remain) are disturbed by operations under this contract, this contractor shall provide pipe and insulation required to re-establish continuity of such piping systems.
- B. This contractor shall arrange for the general contractor to repair and patch all construction with material necessary to match surrounding due to the removal of equipment, piping, and ductwork.
- C. This contractor shall furnish all required labor and material, where required, to extend new work to connect to similar work for extension of existing systems.
- D. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to the owner before disturbing existing installation. Beginning of demolition means installer accepts existing conditions.

PART 2 PRODUCTS
NOT USED
PART 3 EXECUTION
NOT USED

SECTION 220529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe hangers and supports
- B. Accessories
- C. Flashing
- D. Equipment bases
- E. Sleeves

1.02 RELATED SECTIONS

- A. Specification Section 220548 Vibration and Seismic Controls for Plumbing Piping and Equipment
- B. Specification Section 221116 Domestic Water Piping

1.03 REFERENCES

- A. ASME B31.9 Building Services Piping
- B. ASTM F708 Design and Installation of Rigid Pipe Hangers
- C. MSS SP58 Pipe Hangers and Supports Materials, Design and Manufacturer
- D. MSS SP69 Pipe Hangers and Supports Selection and Application
- E. MSS SP89 Pipe Hangers and Supports Fabrication and Installation Practices

1.04 SUBMITTALS

- A. Product Data: Provide manufacturers catalog data including load capacity.
- B. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- C. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of piping.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. Anvil International
 - 2. Tolco/Cooper B-Line
 - 3. Engineer approved equal.
- B. Plumbing Piping Drain, Waste and Vent:
 - 1. Conform to ASME B31.9; ASTM F708
 - 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inch: Carbon steel adjustable swivel, split ring. Figure 104.
 - 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis. Anvil International Figure 260.
 - 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron bracket. Anvil International Figure 213.
 - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp. Anvil International Figure 195.
 - 7. Vertical Support: Steel riser clamp. Anvil International Figure 261.
 - 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support. Anvil International Figure 264.

- 9. Copper Pipe Support: Carbon steel ring, adjustable, and copper plated. Anvil International Figure 97.
- 10. Provide zinc coated hangers and supports for all non air conditioned areas.

C. Plumbing Piping - Water:

- Conform to ASME B31.9; ASTM F708.
- 2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Carbon steel adjustable swivel, split ring. Anvil International Figure 104.
- 3. Hangers for Cold Pipe Sizes 2 Inch and Over: Carbon steel, adjustable, clevis. Anvil International Figure 260.
- 4. Hangers for Hot Pipe Sizes 2 Inch to 4 Inch: Carbon steel, adjustable, clevis. Anvil International Figure 260.
- 5. Hangers for Hot Pipe Sizes 6 Inch and Over: Adjustable steel yoke, cast iron roll, single hanger. Anvil International Figure 181.
- 6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- 7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll. Anvil International Figure 175.
- 8. Wall Support for Pipe Sizes to 3 Inches: Cast iron bracket. Anvil International Figure 213.
- 9. Wall Support for Pipe Sizes 4 Inches Over: Welded steel bracket and wrought steel clamp. Anvil International Figure 195.
- 10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll. Anvil International Figure 195 and 181.
- 11. Vertical Support: Steel riser clamp. Anvil International Figure 261.
- 12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support. Anvil International Figure 264.
- 13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support. Anvil International Figure 264.
- 14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support. Anvil International Figure 274.
- 15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated. Anvil International Figure 97.
- 16. Provide zinc coated hangers and supports for all non air conditioned areas.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end or continuous threaded.

2.03 FLASHING

- A. Metal Flashing: 26 gauge galvanized steel.
- B. Metal Counter Flashing: 22 gauge galvanized steel.
- C. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.
- D. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.

2.04 EQUIPMENT BASES

A. Provide housekeeping pads of concrete, minimum four inch (4") thick and extending six inches (6") beyond supported equipment.

2.05 SLEEVES

- A. Sleeves for pipes through wall below grade shall be Schedule 40, two pipe diameters larger than pipe. Seal with Linkseal.
- B. Sleeves for pipes through non-fire rated floors shall be 18 gauge galvanized steel.
- C. Sleeves for pipes through non-fire rated beams, walls, footings, and potentially wet floors shall be Schedule 40 steel pipe or 18 gauge galvanized steel.
- D. Sleeves for pipes through fire rated and fire resistive floors and walls, and fire proofing to be a fire rated sleeve assembly including seals, UL listed.

- E. Stuffing and Firestopping Insulation: Fiberglass type, non-combustible per UL tested assembly type.
- F. Sealant Manufacturers:
 - 1. Dow Corning Silicone RTV Foam.
 - 2. 3-M Fire Barrier Caulk and Putty.
 - 3. Thomas & Betts Flame Safe Fire Stop System.
 - 4. Engineer approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- C. Place hangers within 12 inch of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub with 5 foot maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.
- K. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

3.03 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum four inch (4") thick and extending six inches (6") beyond all floor supported equipment.
- B. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.04 FLASHING

- A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting three inch (3") minimum above finished roof surface with 24" x 24" sheet size. Turn flanges back into wall and caulk, metal counterflash, and seal for pipes through outside walls. Refer to architectural drawings and specifications for additional information.
- C. Flash floor drains in floors with topping over finished areas with waterproof membrane ten inch (10") clear on sides with minimum 36" x 36" sheet size. Fasten flashing to drain clamp device.
- D. Seal floor, shower, and mop sink drains watertight to adjacent materials.
- E. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.05 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floor one inch above finished floor level. Caulk sleeves.
- D. Provide sleeves where piping penetrates floor, ceiling or wall fire rated assemblies. Close off space between pipe and adjacent work with fire stopping insulation and caulk.
- E. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Install chrome plated steel escutcheons at finished surfaces and within cabinets.

3.06 SCHEDULES

HANGER ROD	MAX. HANGER SPACING	DIAMETER
Pipe Size	Feet	Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10.0	3/8
2-1/2 to 3	10.0	1/2
4 to 6	10.0	5/8
8 to 12	14.0	7/8
14 and Over	20.0	1
PVC (all sizes)	6.0	3/8
C.I. Bell & Spigot (or No-Hub) and at Joints	5.0	5/8

SECTION 220553

IDENTIFICATION FOR PLUMBING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates
- B. Tags
- C. Stencils
- D. Pipe markers
- E. Ceiling tacks
- F. Labels

1.02 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems

1.03 SUBMITTALS

- A. Submit list of wording, symbols, letter size, and color-coding for mechanical identification.
- B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Samples: Submit two tags, 1-1/2 inch in size.
- E. Samples: Submit two labels, 1.9" x 0.75" in size.
- F. Manufacturer's Instructions: Indicate installation instructions, special procedures, and installation.
- G. Project Record Documents: Record actual locations of tagged valves, include valve tag numbers.

1.04 REGULATORY REQUIREMENTS

A. Conform to NFPA 99 requirements for labeling and identification of medical gas piping systems and accessories.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.02 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Information Tags: Clear plastic with printed "Danger, "Caution" or "Warning" and message; size 3-1/4" x 5-5/8" with grommet and self-locking nylon ties.
- D. Tag Chart: Typewritten letter size list in anodized aluminum frame plastic laminated.

2.03 STENCILS

- A. Stencils with Clean Cut Symbols and Letters of Following Size:
 - 1. Outside Diameter of Insulation or Pipe Up to 2 Inches: 1/2 inch high letters.
 - 2. Outside Diameter of Insulation or Pipe 2-1/2" to 6 Inches: One inch (1") high letters.
 - 3. Outside Diameter of Insulation or Pipe Over 6 Inches: 1-3/4 inch high letters.
 - 4. Ductwork and Equipment: 1-3/4 inch high letters.

B. Stencil Paint: Semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.04 PIPE MARKERS

- A. Color and Lettering: Conform to ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
- C. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6" W x 4" mil thick, manufactured for direct burial service.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings indicating flow direction arrow and identification of fluid being conveyed.

2.05 CEILING TACKS

- A. Description: Steel with a 3/4 inch diameter color-coded head.
- B. Color Code as Follows:
 - 1. HVAC Equipment: Yellow.
 - 2. Fire Dampers/Smoke Dampers: Red.
 - 3. Plumbing Valves: Green.
 - 4. Heating/Cooling Valves: Blue.
- C. Coordinate with owner prior to installing.

2.06 LABELS

A. Description: Laminated Mylar, size 1.9" x 0.75" adhesive backed with printed identification.

PART 3 EXECUTION

3.01 PREPARATION

A. De-grease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

- A. Install identifying devices after completion of coverings and painting.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners or adhesive.
- C. Install labels with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. Apply paint primer before applying labels for unfinished canvas covering.
- D. Install tags using corrosion resistant chain. Number tags consecutively by location.
- E. Install underground plastic pipe markers six inch (6") to eight inch (8") below finished grade, directly above buried pipe.
- F. Identify pumps, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Tag automatic controls, instruments, and relays. Key to control schematic.
- J. Identify piping, concealed or exposed with plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 foot on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure and at each obstruction. Identify on both sides of any wall.
- K. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit at each side of penetration of structure or enclosure and at each obstruction.
- L. Provide ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

M. Conform to owner's existing identification scheme. Verify with owner prior to bid. **END OF SECTION**

SECTION 220719 DOMESTIC PLUMBING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiberglass
- B. Flexible elastomeric foam insulation
- C. Jackets

1.02 RELATED SECTIONS

Specification Section 220553 - Identification for Plumbing Piping and Equipment

1.03 REFERENCES

- A. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
- B. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- C. ASTM C177 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus
- D. ASTM C195 Standard Specification for Mineral Fiber Thermal Insulating Cement
- E. ASTM C240 Standard Test Methods of Testing Cellular Glass Insulation Block
- F. ASTM C449/C449M Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
- G. ASTM C518 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- H. ASTM C533 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
- I. ASTM C534 Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
- J. ASTM C547 Standard Specification for Mineral Fiber Preformed Pipe Insulation
- K. ASTM C552 Standard Specification for Cellular Glass Thermal Insulation
- L. ASTM C578 Standard Specification for Preformed, Cellular Polystyrene Thermal Insulation
- M. ASTM C591 Standard Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation
- N. ASTM C610 Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation
- O. ASTM C795 Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
- P. ASTM C921 Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
- Q. ASTM D1056 Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
- R. ASTM D1667 Standard Specification for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers
- S. ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- T. ASTM D2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- U. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- V. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
- W. NAIMA National Insulation Standards.
- X. NFPA 255 Standard Method of Test of Surface Burning Characteristics of Building Materials

Y. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials, and thickness for each service and location.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

1.07 DELIVERY, STORAGE, AND PROTECTION

 Accept materials on site, labeled with manufacturer's identification, product density and thickness.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 FIBERGLASS

- A. Manufacturers:
 - 1. Johns Manville Micro-Lok HP
 - 2. Owens Corning
 - 3. Knauff
 - 4. Engineer approved equal.
- B. Insulation: ASTM C547 rigid molded, noncombustible.
- C. "K" Value: ASTM C335, 0.25 at 75 deg F.
- D. Minimum Service Temperature: 0 deg F.
- E. Maximum Service Temperature: 800 deg F.
- F. Maximum Moisture Absorption: <5% by weight.
- G. Vapor Barrier Jacket: ASTM C1136, white Kraft paper with fiberglass yarn, bonded to aluminized film.
- H. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
- I. Secure with self-sealing longitudinal laps and butt strips.
- J. Surface Burning: ASTM E84; Flame Spread-25, Smoke Developed-50
- K. VOC Content: ASTM D5116; 0.15 g/l

2.02 FLEXIBLE ELASTOMERIC FOAM INSULATION

- A. Manufacturers:
 - 1. Armacell: AP Armaflex
 - 2. Aerocel
 - 3. K-flex
 - 4. Engineer approved equal.
- B. Insulation: ASTM C534 flexible cellular elastomeric molded sheet.
- C. "K" Value: ASTM C177 or C518; 0.27 at 75 deg F.
- D. Minimum Service Temperature: -40 deg F.

- E. Maximum Service Temperature: 220 deg F.
- F. Maximum Moisture Absorption: ASTM D1056, 5.0% by weight gain.
- G. Maximum Water Vapor Permeability: ASTM E96; 0.05 perm-in.
- H. Maximum Flame Spread: ASTM E84; 25
- I. Maximum Smoke Developed: ASTM E84; 50
- J. Insulated Pipe Hangers: Refer to the requirements for elastomeric insulation contained in the Inserts and Shields portion of this section.
- K. Elastomeric Foam Adhesive:
 - Manufacturers:
 - a. Armstrong #BLV 520
 - b. Aeroflex
 - c. Halstead/K-Flex
 - d. Engineer approved equal.
 - 2. Air-dried contact adhesive, compatible with insulation.
 - 3. VOC Content: 0 g/L as calculated and reported by SCAQMD 1168.

2.03 JACKETS

- A. PVC Plastic:
 - 1. Manufacturers:
 - a. Johns Manville Zeston
 - b. Owens Corning
 - c. PIC Plastics
 - d. Engineer approved equal.
 - Jacket: ASTM C921, UV resistant, one piece molded type fitting covers and sheet material, off white color.
 - 3. Minimum Service Temperature: 0 deg F.
 - 4. Maximum Service Temperature: 150 deg F.
 - 5. Moisture Vapor Transmission: ASTM E96; 0.002 perm inches.
 - 6. Maximum Flame Spread: ASTM E84; 25
 - 7. Maximum Smoke Developed: ASTM E84; 50
 - 8. Thickness: 20 mil.
 - 9. Connections: Brush on welding adhesive.
- B. Covering Adhesive Mastic:
 - 1. Manufacturers:
 - a. Johns Manville Perma-Weld
 - b. PIC Plastics
 - c. Engineer approved equal.
 - 2. Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry with foreign material removed.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated Dual Temperature Pipes or Cold Pipes Conveying Fluids Below Ambient Temperature:
 - 1. Provide vapor barrier jackets, factory applied or field applied.
 - 2. Insulate fittings, joints and valves with molded insulation of like material and thickness as adjacent pipe.

- 3. Provide PVC fitting covers.
- Continue insulation through walls (unless in firewall sleeves), pipe hangers and other pipe penetrations.
- 5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- 6. Vapor seal insulation ends every 20 feet.
- D. Insulated Pipes Conveying Fluids Above Ambient Temperature:
 - 1. Provide standard jackets with vapor barrier, factory applied.
 - 2. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe.
 - 3. Provide PVC fitting covers.
 - 4. Continue insulation through walls (unless in firewall sleeves) pipe hangers and other pipe penetrations.

E. Inserts and Shields:

- Manufacturers:
 - a. Jeff Company/Buckaroo
 - b. Amacell
 - c. Cooper/Eaton
 - d. TPS
 - e. Engineer approved equal.
- Shields: Galvanized saddle with flared edges between pipe hangers or pipe hanger rolls and inserts.
- 3. Insert Location: Between support shield and piping and under the vapor barrier and finish jacket.
- 4. Insert Configuration: Minimum six inch (6") long of same thickness and contour as adjoining insulation; may be factory fabricated.
- 5. Insert Type:
 - a. Polystyrene and Fiberglass Insulation: 360 degree polyisocyanurate or phenolic foam cylindrical insert capable of supporting piping system. Pre-fabricated, insulated and jacketed supports are acceptable. Blocks, plugs, or wood material are not acceptable.
 - b. Flexible Elastomeric Foam Insulation: Pre-fabricated 360 degree insulated pipe hanger with polyethylene inserts (Armacell "Armafix" or equal). Match thickness of pipe insulation. Hanger shall have PVC or aluminum jacket. Provide friction tape on inside of pipe clamp/support to avoid slipping.
- F. Insulation shall be continuous at all hangers. Hanger shall not be in direct contact with pipe.
- G. Insulation on piping served by heat trace shall be sized large enough to enclose the pipe and the heat wire.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10% at normal conditions, as materials indicate.

3.04 SCHEDULE

FIBERGLASS INSULATION

PIPING SYSTEMS:	PIPE SIZE	THICKNESS
Plumbing Systems:		
Domestic Hot Water and Re-Circulation	Less than 1.5"	1"
Domestic Hot Water and Re-Circulation	1.5" and Larger	1.5"
Plumbing Vents within 10' of Exterior:	All	1"
Domestic Cold Water	All	1"
Condensate Drain from Cooling Coil:	All	1"
Horizontal Storm Downspouts in Building and Roof	All	1"
Drain Sumps:		
Vertical Storm Downspouts in Building when PVC	All	1"

Piping is used:

Pumped Elevator Storm Water	All	1"
PVC Piping Installed in a Return Air Plenums (including	All	1.5"
Mechanical Rooms)		

FLEXIBLE ELASTOMERIC FOAM INSULATION

PIPING SYSTEMS:	PIPE SIZE	THICKNESS
Plumbing Systems:		
Domestic Hot Water and Re-Circulation:	Less than 1.5"	1"
Domestic Hot Water and Re-Circulation:	1.5" and Larger	1.5
Plumbing Vents Within 10' of Exterior:	All	3/4"
Domestic Cold Water:	All	3/4"
Pumped Elevator Storm Water:	All	3/4"
Walk-In Freezer-Cooler Condensate Piping:	All	3/4"

PIPE JACKET SCHEDULE

PIPE LOCATION:	JACKET MATERIAL
Piping in Mechanical/Electrical/Storage Room within 10' of	PVC
floor (excluding racked piping)	
Exposed Piping in Gyms	PVC

END OF SECTION

SECTION 221116 DOMESTIC PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary sewer piping (beyond 5 ft.)
- B. Sanitary sewer piping (below grade)
- C. Sanitary sewer piping (above grade)
- D. Water piping (beyond 5 ft.)
- E. Water piping (below grade)
- F. Water piping (above grade)
- G. Water piping (apartment and dwelling units)
- H. Ball valves
- I. Ball valves (Budget Projects)

1.02 RELATED SECTIONS

A. Specification Section 220553 - Identification for Plumbing Piping and Equipment

1.03 REFERENCES

- A. ASME B31.1 Power Piping
- B. ASME B31.9 Building Service Piping
- C. ASME Section 9 Welding and Brazing Qualifications
- D. ASME B16.1 Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800
- E. ASME B16.3 Malleable Iron Threaded Fittings
- F. ASME B16.4 Cast Iron Threaded Fittings Class 125 and 250
- G. ASME B16.18 Cast Bronze Solder Joint Pressure Fittings
- H. ASME B16.22 Wrought Copper and Bronze Solder-Joint Pressure Fittings
- I. ASME B16.23 Cast Copper Alloy Solder-Joint Drainage Fittings DWV
- J. ASME B16.26 Cast Bronze Fittings for Flared Copper Tubes
- K. ASME B16.29 Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings -DWV
- L. ASME B16.32 Cast Copper Alloy Solder-Joint Fittings for Solvent Drainage Systems
- M. ASTM A47 Ferritic Malleable Iron Castings
- N. ASTM A53 Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
- O. ASTM A74 Cast Iron Soil Pipe and Fittings
- P. ASTM A120 Pipe, Steel, Black and Hot-Dipped Zinc Coated (galvanized), Welded and Seamless for Ordinary Use
- Q. ASTM A234 Pipe Fittings of Wrought Copper Steel and Alloy Steel for Moderate and Elevated Temperatures
- R. ASTM B32 Solder Metal
- S. ASTM B42 Seamless Copper Pipe
- T. ASTM B43 Seamless Red Brass Pipe
- U. ASTM B75 Seamless Copper Tube
- V. ASTM B88 Seamless Copper Water Tube
- W. ASTM B251 Wrought Seamless Copper and Copper-Alloy Tube

- X. ASTM B302 Threadless Copper Pipe (TP)
- Y. ASTM B306 Copper Drainage Tube (DWV)
- Z. ASTM C14 Concrete Sewer, Storm Drain and Culvert Pipe
- AA. ASTM C425 Compression Joints for Vitrified Clay Pipe and Fittings
- AB. ASTM C443 Joints or Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
- AC. ASTM C564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings
- AD. ASTM C700 Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated.
- AE. ASTM D1785 Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120
- AF. ASTM D2683 Socket type Polyethylene fillings for outside diameter controlled polyethylene pipe
- AG. AWS A5.8 Brazing Filler Metal
- AH. AWWA C105 Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
- AI. AWWA C110 Ductile Iron Gray Iron Fittings three inch (3") through 48 inch for Water and Other Liquids
- AJ. AWWA C111 Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
- AK. AWWA C651 Disinfecting Water Mains
- AL. CISPI 301 Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems
- AM. CISPI 310 Joints for Hubless Cast Iron Sanitary Systems
- AN. NFPA 13 Installation of Sprinkler Systems
- AO. NFPA 13R Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories of Height
- AP. NSF/ANSI 61 Drinking Water System Components Health Effects
- AQ. NSF/ANSI 372 Drinking Water System Components Lead Content

1.04 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 PROJECT RECORD DOCUMENTS

A. Record actual locations of valves.

1.06 OPERATION AND MAINTENANCE DATA

 Maintenance Data: Include installation instructions, spare parts list and exploded assembly views.

1.07 QUALITY ASSURANCE

- A. Perform work in accordance with the State of Iowa.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- D. Welder's Certification: In accordance with ASME Section IX.
- E. Identify pipe with marking including size, material classification, specification, potable water certification and water pressure rating.
- F. Maintain one copy of each document on site.
- G. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or be prior approved by engineer.
- H. All cast iron soil pipe and fittings shall be installed according to the latest edition of the Cast Iron Soil Pipe and Fittings Handbook.

1.08 REGULATORY REQUIREMENTS

- A. Perform work in accordance with local jurisdiction plumbing code.
- B. Conform to applicable code for installation of back flow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of back flow prevention devices.
- D. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

1.09 DELIVERY, STORAGE AND PROTECTION

- A. Deliver, store, protect and handle products to site.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work and isolating parts of completed system.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 SANITARY SEWER PIPING (BEYOND 5 FEET)

- A. Cast Iron Pipe:
 - ASTM A74 service weight.
 - 2. Fittings: Cast iron.
 - 3. Joints: ASTM C564, neoprene gasket system. Neoprene O-ring.
 - 4. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or be prior approved by engineer.
- B. PVC Pipe:
 - 1. ATM D3034, SDR 23.5
 - Fittings: PVC.
 - 3. Joints: ASTM F477 elastomeric gaskets.

2.02 SANITARY SEWER PIPING (BELOW GRADE)

- A. Cast Iron Pipe:
 - 1. ASTM A74 service weight.
 - 2. Fittings: Cast iron.
 - 3. Joints: ASTM C564, neoprene gasket system.
 - 4. Minimum Size: Three inches.
 - 5. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or be prior approved by engineer.
- B. PVC Pipe: Schedule 40
 - 1. ASTM D2665.
 - 2. Fittings: PVC.
 - 3. Joints: ASTM D2855 solvent weld with ASTM D2564 solvent cement.
- C. PVC Pipe:
 - 1. ASTM D2665.
 - 2. Fittings: PVC.
 - Joints: ASTM F477, elastomeric gaskets.

2.03 SANITARY SEWER PIPING (ABOVE GRADE)

A. PVC Pipe:

- 1. ASTM D2665.
- 2. Fittings: PVC.
- 3. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.
- B. PVC Pipe:
 - 1. ASTM D1785 Schedule 40 for not less than 150 psi pressure rating.
 - Fittings: ASTM D2665, PVC.
 - 3. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.04 WATER PIPING (BEYOND 5 FEET)

- A. Piping Less Than Three (3) Inches:
 - 1. ASTM B88, type #K hard drawn, copper tubing.
 - 2. Fittings: ASME B16.18 cast bronze.
 - 3. Joints: AWS A5.8, BCuP silver braze.
- B. Piping Equal to or Greater Than Three (3) Inches:
 - 1. Cement lined ductile cast iron.
 - 2. Joints: Mechanical push-on with conductive neoprene gasket, AWA #C150, #C151.

2.05 WATER PIPING (BELOW GRADE)

- A. Copper Tubing:
 - 1. ASTM B88, type #K hard drawn, piping less than three inches.
 - 2. Fittings: ASME B16.18, cast bronze.
 - 3. Joints: AWS A5.8, BCuP silver braze.
- B. Ductile Iron Pipe:
 - 1. AWWA C151, piping equal to or greater than three inches.
 - 2. Cement lined ductile iron pipe.
 - 3. Fittings: Ductile iron, standard thickness.
 - 4. Joints: AWWA C111, rubber gasket with 3/4 inch diameter rods.

2.06 WATER PIPING (ABOVE GRADE)

- A. Copper Tubing:
 - 1. ASTM B88, type #L hard drawn.
 - 2. Fittings: ASME B16.22, wrought copper and bronze.
 - 3. Joints: ASTM B32, solder, Grade 95TA.

2.07 WATER PIPING (APARTMENT AND DWELLING UNITS)

- A. Manufacturers:
 - 1. Uponor (PEX-a)
 - 2. Rehau (PEX-a)
 - 3. Watts (PEX-b)
 - 4. EverPex (PEX-b)
 - 5. EverHot (PEX-b)
 - 6. Engineer approved equal.
- B. Manufacturer shall provide components for apartment domestic piping PEX tubing distribution system including all piping, fittings, manifolds, supports, and any other ancillary items required for a complete installation.
- C. Warranty: Plastic piping shall carry a 25-year non-prorated warranty against failure due to defect in material and workmanship. Manifolds, headers, valves, and other ancillary components shall be warranted for 12 months from date of substantial completion.
- D. PEX-a Peroxide method Pipe:
 - 1. Pipe:
 - a. ASTM F877/876, SDR 9 cross-linked high density polyethylene PEX-a tubing (Peroxide method).
 - b. Rated for continuous operation by the Plastic Pipe Institute (PPI) at the following conditions: 80 psi @ 200 deg F and 100 psi @ 180 deg F.

2. Fittings:

 Brass fittings with ASTM F2080 or ASTM F1960 cold-expansion compression sleeves. Provide specific fitting types as required to maintain warranty of piping manufacturer.

E. PEX-b Silane method Pipe:

- 1. Pipe:
 - a. ASTM F877/876, SDR 9 cross-linked high density polyethylene PEX-b tubing (Silane method).
 - b. Rated for continuous operation by the Plastic Pipe Institute (PPI) at the following conditions: 80 psi @ 200 deg F and 100 psi @ 180 deg F.
- 2. Fittings:
 - a. Brass or poly fittings with copper crimp rings (ASTM F1807/2159).
 - b. Brass of poly fittings with stainless steel clamp or sleeve (ASTM F2098).
 - c. Push-fit fittings are not allowed (ASSE 1061).
- F. Manifolds: Copper or Polymer manifolds. Each port shall have a valve for branch isolation. Fitting type to match pipe requirements.
- G. Each plumbing fixture shall be served by a home-run line from the manifold without any fittings or splices. Utilize metal or plastic support bends.
- H. Provide copper stub outs as piping penetrates wall at plumbing fixture location. The PEX piping shall not penetrate the finished wall.

2.08 BALL VALVES

- A. Up To and Including 2-1/2 Inches:
 - 1. Manufacturers:
 - a. Apollo
 - b. Watts
 - c. Milwaukee
 - d. Engineer approved equal.
 - 2. Bronze one piece full port body, chrome plated ball, Teflon seats and stuffing box ring, lever handle threaded ends.
- B. 3 Inches and Over:
 - 1. Manufacturers:
 - a. Apollo
 - b. Watts
 - c. Engineer approved equal.
 - Cast steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle, flanged.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Group piping whenever practical at common elevations.

- F. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- I. Establish elevations of buried sanitary and storm sewer piping outside the building to ensure not less than four feet (4') of cover unless otherwise noted.
- J. Establish elevations of buried water service outside the building to ensure not less than six feet (6') of cover unless otherwise noted.
- K. Where pipe support members are welded to structural building frame, scrape, brush clean and apply one coat of zinc rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports and accessories not pre-finished, ready for finish painting.
- N. Install bell and spigot pipe with bell end upstream.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Install water piping to ASME B31.9.
- Q. Sleeve pipes passing through partitions, walls and floors.
- R. Clean out all sanitary sewers to remove any debris prior to substantial completion.
- S. All cast iron soil pipe shall be installed in accordance with cast iron soil pipe institute handbook (latest edition).
- T. All cast iron soil pipe shall be marked with the trademark of the soil pipe institute.
- U. Where static water pressure in the water supply piping exceeds 80 psi, a water pressure reducing valve preceded by a strainer shall be installed and the static pressure reduced to 80 psi or less. Pressure regulator(s) equal to or exceeding 1-1/2 inches shall not require a strainer.

3.03 APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.04 ERECTION TOLERANCES

- A. Establish invert elevations, slopes for drainage to 1/8 inch per foot 1% minimum. Maintain gradients.
- B. Slope water piping minimum 0.25% and arrange to drain at low points.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flush and clean.
- B. The plumbing contractor is to make sure sanitary sewer lines are running smooth by running a snake through the sanitary sewer lines prior turning the facility over to the owner.
- C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder or tablet form throughout system to obtain 50-to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15% of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing from 10% of outlets and from water entry and analyze in accordance with AWWA C651. Submit written report to owner.
- J. Work in this section shall be by a pre-approved water treatment contractor.

3.06 TESTING

- A. Upon completion of a section or of the entire hot and cold water supply system, it shall be tested and proved tight under a water pressure not less than the working pressure under which it is to be used.
- B. The water used for tests shall be obtained from a potable source of supply
- C. Except for plastic piping, a 50 psi air pressure shall be permitted to be substituted for the water test.
- D. In either method of test, the piping shall withstand the test without leaking for a period of not less than 15 minutes.

3.07 SERVICE CONNECTIONS

- A. Provide new sanitary and storm sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves and sand strainer.
 - 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
 - 2. Install service piping and valves as indicated on the site drawing. Provide thrust blocks at all changes in direction. Verify the local city requirements prior to bid.
 - Install remote meter readout and associated wiring. Coordinate location with utility company.
- C. The plumbing contractor is responsible to contact and inform the utility companies, prior to the utility companies coming to the site, of any underground utilities and piping they may be aware of.
- D. Charges by the utility company to provide services shall not be included in the bid and shall be paid directly by the owner.

3.08 UTILITY CONNECTIONS

- A. Connect to existing utility services as shown on the drawings or as required by site conditions.
- B. Before running any new sewer piping, verify elevations where connections are to be made and layout the new sewer. If grades do not allow connection, verify with architect or engineer what procedures to use.
- C. Use caution on sewer extensions so that grades do not become to shallow.
- D. Coordinate equipment and installation requirements with local utility company.
- E. Verify requirements prior to bid.
- F. Charges by the utility company to provide services shall not be included in the bid and shall be paid directly by the owner.
- G. The plumbing contractor is responsible to contact and inform the utility companies, prior to the utility companies coming to the site, of any underground utilities and piping they may be aware of.

3.09 SCHEDULES

A. See the drawings.

END OF SECTION

SECTION 221119 DOMESTIC PLUMBING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Floor drain
- B. Clean out
- C. Wall hydrant
- D. Roof hydrant
- E. Recessed valve box
- F. Backflow preventer
- G. Water hammer arrestor
- H. Pressure balanced mixing valve

1.02 RELATED SECTIONS

- A. Specification Section 221116 Domestic Plumbing Piping
- B. Specification Section 223000 Plumbing Equipment
- C. Specification Section 224000 Plumbing Fixtures

1.03 REFERENCES

- A. ASME A113.6.3; Floor and Trench Drains
- B. ASME A113.6.4 Roof, Deck and Balcony Drains
- C. ASSE 1010-01; Water Hammer Arrestors
- D. ASSE 1011 Hose Connection Vacuum Breakers
- E. ASSE 1012 Backflow Preventers with Immediate Atmospheric Vent
- F. ASSE 1013 Backflow Preventers, Reduced Pressure Principle
- G. ASSE 1019 Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types
- H. ASTM C478 Precast Reinforced Concrete Manhole Sections (ASTM C478M Precast Reinforced Concrete Manhole Sections
- AWWA C506 Backflow Prevention Devices Reduced Pressure Principle and Double Check Valve Types
- J. PDI G-101 Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data
- K. PDI WH-201 Water Hammer Arrestors
- L. NSF/ANSI 61 Drinking Water System Components Health Effects
- M. NSF/ANSI 372 Drinking Water System Components Lead Content

1.04 SUBMITTALS

- A. Product Data: Provide component sizes, rough-in requirements, service sizes and finishes.
- B. Shop Drawings: Indicate dimensions, weights and placement of openings and holes.
- C. Certificates: Certify that grease interceptors meet or exceed specified requirements.
- D. Manufacturer's Instructions: Indicate assembly and support requirements.
- E. Project Record Documents: Record actual locations of equipment, clean out, backflow preventers, water hammer arrestors.
- F. Operation Data: Indicate frequency of treatment required for interceptors.
- G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 DELIVERY, STORAGE AND PROTECTION

Accept specialties on site in original factory packaging. Inspect for damage.

1.07 REGULATORY REQUIREMENTS

A. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

PART 2 PRODUCTS

2.01 FLOOR DRAIN (FD-1)

- A. Manufacturers:
 - 1. Watts #FD-100
 - 2. Smith
 - 3. Zurn
 - 4. Josam
 - 5. Wade
 - 6. Sun Drainage
 - 7. Engineer approved equal.
- B. Assembly: ASME A112.6.3.
- C. Epoxy coated cast iron floor drain with anchor flange, reversible clamping collar with primary and secondary weepholes and adjustable strainer.
- D. Accessories:
 - 1. Provide with membrane clamp on all floor drains installed above slab ongrade.
 - 2. Provide with strainer extension to accommodate thick fills as required.
- E. Strainer: Seven inch (7") diameter nickel bronze strainer.
- F. Contractor shall select outlet type.
- G. Outlet size: As noted on drawings.
- H. Options: Provide where indicated:
 - 1. 6 x 6 square nickel bronze strainer.
 - 2. Heavy Duty (HD) strainer.
 - 3. Sediment bucket.
 - 4. Trap primer.

2.02 CLEAN OUT

- A. Manufacturers:
 - 1. Watts
 - 2. Smith
 - 3. Josam
 - 4. Wade
 - 5. Sun Drainage
 - 6. Engineer approved equal.
- B. Interior Finished Sub or On Grade Floors:
 - 1. Watts #C0-200-R
 - Lacquered cast iron bodies with integral anchor flange, neoprene "O" ring secondary test seal and adjustable combined access cover and plug with gasket seal. Nickel-bronze scoriated cover in service area and round with depressed cover to accept floor finish in finished floor areas.
- C. Interior Finished Membrane Floor Areas:
 - 1. Watts #CO-200-C-R

- 2. Lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar and adjustable nickel-bronze strainer round with scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas.
- D. Interior Finished Wall Areas:
 - 1. Watts #CO-380-RD
 - 2. Line type with lacquered cast iron body and round epoxy coated gasket cover and round stainless steel access cover secured with machine screw.
- E. Interior Unfinished Accessible Areas: Caulked or threaded type. Provide bolted stack clean out on vertical rainwater leaders and on horizontal accessible pipes.
- F. Exterior Cleanouts:
 - 1. Provide with brass plug with all cast iron cleanout cover equal to Josam #Y-620.
 - 2. Refer to detail on drawings.
- G. Cleanout size shall be equal to pipe size up to 4 inches.

2.03 WALL HYDRANT (WH-1)

- A. Manufacturers:
 - 1. Woodford #B67
 - 2. Prier #C-634BX
 - 3. Engineer approved equal.
- B. Type: ASSE 1019 non-freeze, self draining type with polished brass lockable recessed box hose thread spout, lockshield and removable key with integral double check backflow preventer.
- C. 3/4" inlet and outlet.
- D. Architect to select finish.

2.04 ROOF HYDRANT

- A. Manufacturers:
 - 1. Woodford RHY2-MS
 - 2. Prier #P-RH2
 - 3. Jay R. Smith Mfg. Co.
 - 4. Engineer approved equal.
- B. ASSE 1052 backflow prevention, freeze proof, self draining type, anti-siphon with 3/4" hose nozzle, lockable handle, vacuum breaker, dual backflow preventer, flow control lock, max. pressure 100 psi.
- C. Mounting System: Cast iron adjustable bracket support with above and under deck flange, well seals, EPDM boot cover.
- Contractor shall provide a 1/4" copper drain line to the nearest floor drain/floor sink/janitorial sink.

2.05 RECESSED VALVE BOX

- A. Manufacturers:
 - 1. Guy Gray #82032 Galvanized
 - 2. Engineer approved equal.
- B. Washing Machine: Pre-formed rough-in box with 1/2" brass long shank water valves with wheel handles, socket for two inch (2") threaded center drain and slip in finishing cover.
- C. Provide a stainless steel sleeve extension with wall flange, where recessed valve box is installed in a block wall.

2.06 RECESSED DRYER VENT WALL BOX

- A. Manufacturers:
 - 1. Guy Gray #82426 steel (2x4 wall)
 - 2. Deflect-o #DVBOX (Plastic)
 - 3. Engineer approved equal.

B. High impact polystyrene plastic to be installed between wall studs. Top center vent opening for upward exhaust direction.

2.07 BACKFLOW PREVENTERS (RPZ, 2" AND SMALLER)

- A. Manufacturers:
 - 1. Watts LF919
 - 2. Zurn/Wilkins
 - 3. Conbraco/Apollo
 - 4. Febco
 - 5. Ames
 - 6. Engineer approved equal.
- B. Description: Reduced Pressure Zone Assembly consisting of two independent check valves with a pressure monitored chamber in between. The chamber contains a differential pressure relief valve that relieves excess pressure preventing back flow or back siphonage.
- C. Construction:
 - 1. Springs: Stainless Steel
 - 2. Discs: Silicone
 - 3. Access ports: Device shall have 3 access ports. One for each check valve and one for the relief valve assembly. A single access port is not acceptable.
- D. Accessories:
 - 1. Strainer: Y-type lead free strainer
 - 2. Air Gap Fitting: Provided by BFP manufacturer
 - 3. Shut off Valves: Quarter turn ball valves
- E. Approvals:
 - 1. ASSE 1013
 - 2. Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California.
 - 3. NSF/ANSI 61 (Less than 0.25% Lead by weight)
 - 4. UL Classified (not valves)

2.08 WATER HAMMER ARRESTOR

- A. Manufacturers:
 - 1. Zurn "Shoktro" #Z-1700
 - 2. Sioux Chief
 - 3. Engineer approved equal.
- B. ANSI A112.26.1; sized in accordance with PDI WH-201 pre-charged suitable for operation in temperature range of -100 deg to 250 deg F and maximum 350 psig working pressure.

2.09 PRESSURE BALANCED MIXING VALVES

- A. Manufacturers:
 - 1.
 - 2. Engineer approved equal.
- B. Valve: Chrome plated cast brass body, stainless steel cylinder, and integral temperature adjustment.
- C. Capacity: 1.5 gpm.
- D. Differential: 45 psi.
- E. Accessories:
 - 1. Volume control shut-off valve on outlet.
 - 2. Stem thermometer on outlet.
 - 3. Strainer stop checks on inlets.
- F. Cabinet: Prime coated 16 gauge steel for surface mounting with keyed lock.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate cutting and forming of roof and floor construction to receive drains to require invert elevations.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend clean out to finished floor or wall surface. Lubricate threaded clean out plugs with mixture of graphite and linseed oil. Ensure clearance at clean out for rodding of drainage system. Coordinate all cleanout locations with the architect.
- C. Furnish and install cleanouts at locations as specified and required by local plumbing code.
- D. Encase exterior clean out in concrete flush with grade.
- E. Install floor clean out at elevation to accommodate finished floor.
- F. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior hose bibbs and exterior wall hydrants.
- G. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures. Fabricate same size as supply pipe or 3/4 inch minimum and minimum 18 inch long.
- H. Install air gap fittings at all equipment drains when equipment is connected to domestic water.
- I. Provide floor drains installed above slab on-grade with membrane clamp and 3' x 3' vinyl membrane. Membrane is by the mechanical contractor.
- J. Coordinate all floor drain locations with associated equipment.
- K. Coordinate all wall mounted device locations with architect.
- L. Install flood protection shutdown valve upstream of building backflow preventer.
- M. Install back water valves where required by local codes. Coordinate with architect.
- N. Route grease interceptor vent pipes back through building to roof. Coordinate routing with engineer and architect prior to rough-in.

END OF SECTION

SECTION 223000 PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electric water heater (Commercial)
- B. Water softener

1.02 REFERENCES

- A. ASHRAE 90A Energy Conservation in New Building Design
- B. ASME Section 8D Pressure Vessels
- C. NFPA 30 Flammable and Combustible Liquids Code
- D. NFPA 54 National Fuel Gas Code
- E. NFPA 58 Storage and Handling of Liquefied Petroleum Gases
- F. NFPA 70 National Electrical Code
- G. UL 1453 Electric Booster and Commercial Storage Tank Water Heaters
- H. UL 174 Household Electric Storage Tank Water Heaters
- I. ASME Section VIIID Pressure Vessels; Boiler and Pressure Vessel Codes
- J. ANSI/NEMA 250 Enclosure for Electrical Equipment (1000 volts max.)
- K. NSF/ANSI 61 Drinking Water System Components Health Effects
- L. NSF/ANSI 372 Drinking Water System Components Lead Content

1.03 SUBMITTALS

A. Product Data:

- 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
- 2. Indicate pump type, capacity, power requirements, and affected adjacent construction.
- 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
- 4. Provide electrical characteristics and connection requirements.

B. Shop Drawings:

- 1. Indicate heat exchanger dimensions, size of tappings, and performance data.
- 2. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

1.04 OPERATION AND MAINTENANCE DATA

A. Include operation, maintenance and inspection data, replacement part numbers, availability, service depot location, and telephone number.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.
- C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
 - 1. American Gas Association (AGA).
 - 2. National Sanitation Foundation (NSF).
 - 3. American Society of Mechanical Engineers (ASME).
 - 4. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
 - 5. National Electrical Manufacturers' Association (NEMA).
 - 6. Underwriters Laboratories (UL).

D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation; operate within 25% of midpoint of published maximum efficiency curve.

1.06 REGULATORY REQUIREMENTS

- A. Conform to NSF, NBBPVI, and ANSI/NFPA requirements for water heaters.
- B. Conform to ASME Section VIIID for manufacture of pressure vessels for heat exchangers.
- C. Conform to ASME Section VIIID for tanks.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- E. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver, store, protect and handle products to site under provisions of Architectural Specification Sections.
- B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.08 WARRANTY

- A. Provide five-year manufacturer warranty under provisions of Architectural Specification Sections.
- B. Provide a two-year manufacturer warranty for the variable speed packaged pumping system.

1.09 MAINTENANCE PRODUCTS

- A. Supply two 50 lb. bags of water softener salt.
- B. Provide each water softener system full of salt at substantial completion.

1.10 EXTRA MATERIALS

A. Provide two pump seals.

PART 2 PRODUCTS

2.01 ELECTRIC WATER HEATER (COMMERICAL)

- A. Manufacturer:
 - 1. Bradford White
 - 2. A.O. Smith
 - 3. State
 - 4. Rheem
 - 5. Engineer approved equal.
- B. Type: Factory-assembled and wired, electric, vertical storage.
- C. Performance: See schedule.
- D. Tank: Glass lined welded steel; four inch (4") diameter inspection port, thermally insulated with minimum 2-1/2" polyurethane encased in corrosion-resistant steel jacket; baked-on enamel finish.
- E. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 140 deg F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box. Wire double element units so elements do not operate simultaneously, unless noted otherwise.
- F. Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.

2.02 WATER SOFTENER (MULTI-TANK)

- A. Manufacturers:
 - 1. Culligan

- 2. Marlo
- 3. Ecowater Systems
- 4. Kinetico
- 5. Engineer approved equal.
- B. Provide as indicated a vertical pressure type water softener system complete with pressure vessel, softening resin, control valve, brine maker and electronic controller. The system will be of an approved design as fabricated by a manufacturer regularly engaged in the production of water treatment equipment. All equipment and material will be supplied in compliance with the specifications as intended for a complete and operational system.
- C. The purpose of the automatic water softener will be to remove mineral hardness from a known water supply to a level not to exceed 17.1 mg/l, as determined by an accepted ASTM or EDTA test method.
- D. There shall be a quantity of one (1) of the above described systems.
- E. Performance and Design Data
 - See schedule on the drawings.
- F. Softener Tank(s)
 - 1. The overall tank height (less base) shall be sufficient to allow for a proper freeboard space above the resin bed for adequate expansion of the resin during backwashing.
- G. Main Operating Valve
 - The main operating valve shall be of a top mount design constructed of all brass and sized with 2.0 inch NPTI inlet and outlet connections.
 - 2. The main operating valve will be of the motor driven, mechanically activated design with five (5) positions to accomplish the regeneration steps of backwash, brine draw/rinse, fast rinse and brine refill, in addition to the service position.
 - 3. The main operating valve shall incorporate self adjusting flow regulators to control the rate of flow and prevent resin loss during backwash regardless of system pressure fluctuations between 30.0 and 120.0 psi.
 - 4. The main operating valve will be fitted with a fixed orifice eductor.
 - 5. The unit shall be supplied so that the valve will not allow automatic bypass of untreated water during regeneration. The bypass shall be integral to the main operating valve body and be capable of being easily modified to allow untreated water bypass.

H. Controls

- A fully integrated programmable microprocessor driven electronic controller shall be provided to automatically cycle the main operating valve through the regeneration sequence. The electronic controller shall be designed and manufactured by the same manufacturer as the water treatment equipment.
- 2. The controller shall be capable of initiating a regeneration by accepting an internal signal from the controller time keeping device; an external Hall-Effect flow sensor, an external device such as a remote start push-button or any combination of these methods. The controller shall sequence all steps of an automatic regeneration and automatically return the softener to a service or stand-by mode. The initiating time and/or volume setpoints shall automatically reset upon completion of the regeneration sequence.
- 3. The controller shall include a sealed keypad, capable of programming all controller functions, located inside the controller enclosure. The controller display shall be a multi-line OLED display capable of full text readouts of operating status and codes.
- 4. An audible alarm beeper capable of emitting a tone of ~70 dBA shall be available but capable of being disabled if so desired.
- 5. The controller shall allow for a manual initiation of the automatic regeneration sequence by utilizing a regeneration selection from the controller program.
- 6. The controller shall operate on a low voltage electrical system. The system shall include a UL/CUL listed transformer. The entire electronic control package and its associated inputs/outputs shall require not more than 24 VAC @ 100VA.

7. The controller shall utilize EEPROM to save pertinent programmed data and statistical functions. The controller must retain all functionality for power interruptions of less than 12 hours. A battery backup shall be installed and capable of maintaining the time of day for a minimum of 5 years.

I. System control options

- 1. An operator selected program of immediate or delayed volume initiated regeneration for parallel/progressive configurations shall be available. The controller shall be capable of being programmed in the field without additional interface devices. The controller shall indicate various data that includes flow rate, capacity remaining, total flow since installation, number of regenerations in the last 14 days, days since the last regeneration, total number of regenerations for the life of the unit, time of day, Progressive Flow Trip Point, and unit in regeneration.
- 2. Each control shall have a dedicated flow sensor. Mode of operation shall be as follows:
- 3. Each controller shall be programmed with a Trip Point. The purpose of the Trip Point shall be to bring additional tanks to an on line status from stand by once the treated water flow demand of the facility meets the Trip Point flow rate. Systems having three media tanks will have tanks brought on line as multiples of the Trip Point flow rate are attained. Tanks shall be taken back off line as flow decreases to a level less than the Trip Point multiple for a minimum of 60 seconds.
- 4. Each controller shall allow for a regeneration delay. The purpose of the delay shall be to inhibit consecutive regenerations thereby allowing a suitable amount of time to pass between regenerations for making saturated brine solution.
- 5. Multiple Unit Communication input/output shall be type RS485. The communication input/output feature will recognize when another controller within a multiple controller system is in a regeneration sequence, prohibiting the chance of multiple units regenerating simultaneously.
 - a. In addition the following functions shall be provided as part of the system controller:
- 6. Regeneration sequence timers: The controller shall allow control customization of individual regeneration cycle times, each programmable from 1 99 minutes. The regeneration cycle and time of cycle remaining shall be displayed when in regeneration.
- 7. Lockout function: The controller shall include a lockout to prevent unauthorized personnel from altering program data.
- 8. Regeneration override: The controller shall include a function to direct pre-programmed regeneration after a user determined period of time (hours or 24 hour intervals) without an input signal from another regeneration initiation device.
- 9. Alarm status indicator: The controller shall monitor operation of internal functions. If a fault is identified, the need for operator intervention will be signaled visually within the controller display.
- 10. Two Auxiliary Outputs: Two Auxiliary Outputs shall be integral to the controller circuit board. Each Output shall be capable of being programmed to provide power to a "Normally Open" or "Normally Closed" contact (user choice). These 24VAC outputs shall be used only for the purpose of energizing a relay coil.
- 11. Flow rate indication: The controller shall be capable of indicating the flow rate of the treated water.
- 12. Totalizer: The controller shall include a totalizer function and a display capacity to 99,999,999 units before resetting to zero. The totalizer value shall be displayed through the controller display during operation.

J. Flow Sensor(s)

- 1. A flow sensor package shall be provided consisting of an insertion-type Hall Effect flow transducer with an appropriately sized installation fitting.
- 2. The fitting provided shall be 2.0 inches, compatible with the specified piping. It will be designed to allow ease of removal of the sensor for inspection without modification of the piping system. A 15 foot length of cable shall be provided for direct connection to the system controller.

- 3. The flow sensor package provided shall be functional within the flow range of 1.5 to 150.0 gpm and will be provided with a 2.0" flow sensor installation fitting.
- 4. The operating temperature/pressure range of flow sensor fittings shall be 34°-100°F at 100.0 psi max.
- 5. The wetted surfaces of the flow sensor shall be constructed of non-corroding materials such as polypropylene, black Polyvinylidene (PVDF) and titanium.
- 6. The flow sensor shall have an accuracy to 1% over full range and repeatability to +/-0.5% of full range.

K. Exchange Resin

- 1. The ion exchange resin shall be virgin high capacity "standard mesh" of sulfonated polystyrene type stable over the entire pH range with good resistance to bead fracture from attrition or osmotic shock. The resin shall be solid, U.S. standard screen and will contain no agglomerates, shells, plates or other shapes that might interfere with the normal function of the water softener. The resin shall be manufactured to comply with the food additive regulation 21 CFR 173.25 as set forth by the USFDA.
- 2. The system shall include 5.0 ft³ of exchange resin per vessel and a total of 15.0 ft³ of resin for the system.

L. Brine System

- 1. Provide a complete brine system consisting of a plastic tank, cover, salt platform, brine well, an automatic brine valve and all necessary fittings for operation with the water softening system. The system shall consist of a combined brine measuring and salt storage tank with salt platform. The system will include a total of one (1) brine tank(s).
- 2. The brine tank will be equipped with a float operated non-corrosive field serviceable brine float valve for automatic control of brine withdrawal and fresh water refill.
- 3. The brine valve will automatically open to admit brine to the resin tank during eduction and close automatically providing positive shut-off to prevent air from entering the system. The brine valve will also regulate the flow of soft water into the brine tank during refill. The brine valve works with the timed fill feature of the main operating valve controls to admit the correct volume of fresh water to the brine tank in accordance with the refill time setting in the control program. The brine valve will include a float operated safety shut-off valve as a back up to the timed refill from the main operating valve control to prevent brine tank overflow.

M. Accessories

- Water test kits for hardness tests will be supplied.
- Pressure Gauges for hard water inlet and soft water outlet.
- 3. Vacuum Breaker for protecting Fiberglass tanks from vacuum.

N. Field Service

1. The services of a factory authorized service representative can be made available to supervise, inspect and provide operator training as required for initial start-up and system operation. Contact your local Culligan dealer for service rates and scheduling.

PART 3 EXECUTION

3.01 WATER HEATER INSTALLATION

- Install in accordance with manufacturer's instructions.
- B. Coordinate with plumbing piping and related fuel piping, gas venting, and, electrical work to achieve operating system.
- C. Install unit with clearance for removal without disturbing other installed equipment or piping.
- D. Pipe relief valves and drains to nearest floor drain.
- E. Provide FEMA 361 compliant 1/4" thick steel elbow fastened to the FEMA 361 enclosure where penetrating the FEMA 361 enclosure. Fastening method shall be similar to the duct fastening method. See safe room duct work penetration for additional information.

3.02 PUMP INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Ensure shaft length allows sump pumps to be located 25 inch minimum below lowest invert into sump pit and six inch (6") minimum clearance from bottom of sump pit.
- C. Provide air cock and drain connection on horizontal pump casings.
- D. Provide line sized isolating valve and strainer on suction.
- E. Provide line sized soft-seated check valve and balancing valve on discharge.
- F. Decrease from line size with long radius reducing elbows or reducers.
- G. Support piping adjacent to pump such that no weight is carried on pump casings.
- H. Provide supports under elbows on pump suction and discharge line sizes four inch (4") and over
- I. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation and operate within 25% of midpoint of published maximum efficiency curve.
- J. Install aguastat on hot water recirculation pipe to control water heater re-circulation pump.
- K. Low voltage wiring shall be by the mechanical contractor unless otherwise noted.

3.03 DOMESTIC WATER HEAT EXCHANGER INSTALLATION

- A. Install tanks in accordance with manufacturer's instructions.
- B. Install unit with clearance for tube bundle removal without disturbing other installed equipment for piping.
- C. Pipe relief valves and drains to nearest floor drain.
- D. Support unit on floor.
- E. Connect steam branch line from top of main.
- F. Pipe in flexible manner, pitched with steam flow with pipe union connections.
- G. Provide steam pressure gauge at exchanger inlet.
- H. Provide steam traps and valves as indicated.
- I. Install compression tank on system side of water heater.
- J. Provide condensate pumps if unit cannot gravity drain to condensate receiver.
- K. Align and verify alignment of base mounted pumps prior to start up.

3.04 WATER SOFTENER INSTALLATION

- A. Install as per manufacturer's instructions.
- B. Connect cold hard water, soft cold water, and brine piping to unit.
- C. Pipe back flush to floor drain with standpipe.

3.05 CONNECTION TO EQUIPMENT FURNISHED BY OWNER

- This contractor shall furnish all connections to equipment furnished by the owner.
- B. This equipment shall include, but not be limited to the following:
 - 1. Air compressor.
 - 2. Washer.
 - 3. Hose dryer.
 - 4. Shop vac.
 - 5. Power washer.
 - 6. Station for filling breathing tanks.
 - 7. Stove range hood.
- C. Domestic Hot Water Storage Tanks:
 - 1. Provide steel pipe support, independent of building structural framing members.

2. Clean and flush after installation. Seal until pipe connections are made.

END OF SECTION

SECTION 224000 PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Water closets
- B. Showers
- C. Lavatories
- D. Sinks

1.02 RELATED SECTIONS

- A. Specification Section 220529 Hangers and Supports for Plumbing Piping and Equipment
- B. Specification Section 221116 Domestic Plumbing Piping
- C. Specification Section 221119 Domestic Plumbing Specialties
- D. Specification Section 223000 Plumbing Equipment

1.03 REFERENCES

- A. ANSI Z124.2 Gel-Coated Fiberglass Reinforced Polyester Resin Shower Receptor and Shower Stall Units
- ARI 1010 Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers
- C. ASME A112.6.1 Supports for Off-the-Floor Plumbing Fixtures for Public Use
- D. ASME A112.18.1 Finished and Rough Brass Plumbing Fixture Fittings
- E. ASME A112.19.1 Enameled Cast Iron Plumbing Fixtures
- F. ASME A112.19.2 Vitreous China Plumbing Fixtures
- G. ASME A112.19.3 Stainless Steel Plumbing Fixtures (Designed for Residential Use)
- H. ASME A112.19.4 Porcelain Enameled Formed Steel Plumbing Fixtures
- I. ASME A112.19.5 Trim for Water-Closet Bowls, Tanks, and Urinals
- J. NFPA 70 National Electrical Code
- K. NSF/ANSI 61 Drinking Water System Components Health Effects
- L. NSF/ANSI 372 Drinking Water System Components Lead Content

1.04 SUBMITTALS

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough in dimensions, utility sizes, trim, and finish.
- B. Manufacturer's Instructions: Indicate installation methods and procedures.
- C. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- D. Warranty: Submit manufacturer's warranty and ensure forms have been completed in owner's name and registered with manufacturer.
- E. The mechanical contractor shall coordinate all fixtures with general construction and cabinetry prior to submitting for review.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

B. Wetted surfaces of brass and bronze components shall contain <0.25% weighted average lead content (lead free) as defined by NSF/ANSI Standards 61 and 372.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08 WARRANTY

A. Provide manufacturer's standard warranty for electric water cooler.

PART 2 PRODUCTS

2.01 WATER CLOSET (WC-1)

- A. Manufacturers:
 - 1. Kohler #K –3422-0 (1.6 gpf.)
 - 2. American Standard
 - 3. Eljer
 - 4. Gerber
 - 5. Mansfield
 - Engineer approved equal.
- B. Tank:
 - 1. Close coupled tank.
 - 2. Supply with loose key stop.
- C. Bowl:
 - 1. ANSI/ASME A112.19.2, white, elongated bowl, floor mounted, siphon jet, vitreous china, and china bolt caps.
- D. Seat:
 - 1. Church 380TCA closed front seat with cover.
 - 2. Solid white plastic, open front, extended back, self-sustaining check hinge, and brass bolts.

2.02 SHOWER (SH-1)

- A. Manufacturers:
 - 1. Symmons #1-801 S-RC14 short
 - 2. Engineer approved equal.
- B. Cabinet:
 - 1. Stainless steel 18 gauge with polished finish and soap dish.
 - 2. Provide stainless steel cover extension to above ceiling.
- C. Trim:
 - 1. 800 series pressure balancing valve.
 - 2. Powers thermostatic/pressure shower valve, e710.
 - 3. ASME A112.18.1 concealed shower supply with lever handle, 2-1/2 gpm flow restrictor, 1/2 inch IPS supply inlets, and check stops with integral strainer.
- D. Showerhead:
 - 1. Symmons #4-295 Fre-Flow fixed spray vandalproof institutional shower head, polished chrome with adjustable spray pattern with 2.5 gpm flow control.
 - 2. Verify mounting height with architectural drawings.
 - 3. Mount bottom of the men's showerhead at 77 inches AFF. Verify mounting height.
 - 4. Mount bottom of the women's showerhead at 70 inches AFF. Verify mounting height.
- E. Drain:
 - 1. Floor drain with sediment bucket flush with shower floor.
 - 2. Seal tight with 40 mil PVC 36 x 36 inches minimum.

F. Enclosure by general contractor.

2.03 SHOWER (SH-2)

- A. Manufacturers:
 - 1. Symmons
 - 2. Bradley
 - 3. Powers
 - 4. Engineer approved equal.
- B. Trim:
 - 1. Powers thermostatic/pressure shower valve #410.
 - 2. ASME A112.18.1 concealed shower supply with lever handle, 2-1/2 gpm flow restrictor, 1/2 inch IPS supply inlets, and check stops with integral strainer.
- C. Showerhead:
 - 1. Symmons #4-231 Super Shower Head, polished chrome with adjustable spray pattern with 2.5 gpm flow control.
- D. Drain:
 - 1. Floor drain with sediment bucket flush with shower floor.
 - 2. Seal tight with 40 mil PVC 36 x 36 inches minimum.
- E. Enclosure by general contractor.

2.04 LAVATORY (L-1)

- A. Manufacturer:
 - 1. Kohler Pennington #K-2196-4-0
 - 2. American Standard
 - Eljer
 - 4. Engineer approved equal.
- B. Basin:
 - 1. ANSI/ASME A112.19.2, white, vitreous china counter top lavatory, drilling on four inch (4") centers, front overflow, self-rimming, faucet ledge.
- C. Trim:
 - Delta #523-WFHGMHDF
 - 2. AASME A112.18.1 chrome plated supply fittings, water economy aerator, metal grid strainer, single lever handle, deck mount, chrome plated 17 gauge brass p-trap, four inch (4") centers. Supplies with loose key stop.

ALTERNATE #1

- D. Trim:
 - 1. Delta 520 WFHDF
 - ASME A112.18.1, chrome finish, single handle, four inch (4") centers, aerator, pop-up drain with tailpiece, chrome plated 1-1/4 inch trap, supplies with loose key stops. ALTERNATE #2
- E. Trim: Chicago #794-317-255 with pop-up or 786-E3-255 grid drain.

ALTERNATE #3

F. Trim: Chicago #23T744 with pop-out.

ALTERNATE #4

G. Trim: Chicago #797A-317-255 with wrist handles.

ALTERNATE #5

H. Trim: Delta #21T244 with wrist handles.

ALTERNATE #6

- I. Trim:
 - 1. Delta #2599-HGMHGF

2. ASME A112.18.1, chrome finish, water economy aerator, metal grid strainer, four inch (4") wrist blade handles, deck mount, chrome plated, 17-gauge brass p-trap, and four inch (4") centers. Supplies with loose key stops.

ALTERNATE #7

J. Trim:

- Delta #2599-HDM
- 2. ASME A112.18.1, chrome finish, water economy aerator, pop-up drain with tailpiece, four inch (4") wrist blade handles, deck mount, chrome plated, 17-gauge brass p-trap, four inch (4") centers. Supplies with loose key stops.

ALTERNATE #8

K. Trim:

- 1. Delta #596-HGMHDF
- 2. Battery powered infrared faucet with deck mounted mixing control.
- 3. Grid strainer.

2.05 SINK (S-1)

- A. Manufacturers:
 - 1. Elkay
 - 2. Just
 - 3. Engineer approved equal.

B. Bowl:

- 1. Elkay #LR-1918
- 2. Stainless steel 16" x 11-1/2" x 7-1/2" deep single compartment type #304, 18 gauge, self rim, undercoated, three hole, Dearborn #16 basket strainer.

C. Trim:

- 1. Delta #101-WFELHHDF
- Faucet to be eight inch (8") swing spout with aerator and single lever handle, 17 gauge, 1-1/2 inch chrome plated p-trap with clean out, 1/2 inch supplies with loose key stops. ALTERNATE #1

D. Trim:

- 1. Delta #26T2944
- 2. Rigid six inch (6") radius gooseneck faucet with aerator and four inch (4") wrist blade handles, eight inch (8") center deck mount, 17 gauge, 1-1/2 inch chrome plated p-trap with clean out, 1/2 inch supplies with loose key stops.

ALTERNATE #2

E. Trim:

- 1. Delta #27T3944
- 2. Rigid six inch (6") radius gooseneck faucet with aerator and four inch (4") wrist handles, four inch (4") center deck mount, 17 gauge, 1-1/2 inch chrome plated p-trap with clean out, supplies with loose key stops.

ALTERNATE #3

F. Trim:

- 1. Sloan # -ETF-660.
- 2. Sensor operated faucet with aerator.
- 3. Single 24 vac solenoid operators, valves with clean out filter.
- 4. Input: 120 vac.
- 5. Output: 24 vac.
- 6. Plug in transformer.
- 7. Optima ON-Q, 24 vac sensor assembly.
- 8. Wiring box assembly and mounting hardware.
- 9. Diagnostic LED indicators on junction box.
- 10. Chrome plated 1-1/2 inch p-trap with clean out, 17 gauge, supplies with loose key stops.
- 11. All 24 volt wiring by the mechanical contractor.

- 12. Provide cover for third hole.
- G. Just Sinks Only: Provide mounting bolts as required.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks prior to ordering.
- D. Confirm that hole drillings are of appropriate number and spacing for trim.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install each fixture with trap, easily removable for servicing and cleaning.
- C. Provide chrome plated rigid or flexible supplies to fixtures with 1/4 turn loose key stops, reducers and escutcheons.
- D. Install components level and plumb.
- E. Install and secure fixtures in place with wall supports or wall carriers and bolts.
- F. Seal fixtures to wall and floor surfaces with sealant. Color to match fixture. Verify with architect.
- G. Solidly attach water closets to floor with lag screws. Flashing is not intended to hold fixture in place.
- H. Coordinate electronic faucet under deck mixing valve and control module installation such that they do not extend passed the footprint of the plumbing fixture. The control module shall be installed over the low voltage junction box.

3.04 INTERFACE WITH OTHER PRODUCTS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

 Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

END OF SECTION

SECTION 230050 BASIC HVAC REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic HVAC Requirements specifically applicable to Mechanical Division Specification Sections.
- B. Division 23 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

1.02 OWNER OCCUPANCY

- A. The owner will occupy the premises during the construction period.
- B. Limit use of site and premises to allow owner occupancy.
- C. Cooperate with the owner to minimize conflict and to facilitate owner's operations.
- D. Schedule the work to accommodate this requirement.

1.03 REGULATORY REQUIREMENTS

- A. This contractor shall give proper authorities all requisite notices relating to work in his charge, obtain official permits, licenses for temporary construction and pay proper fees for it.
- B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by himself, by his employees or through any operation under his charge, whether in the contract or extra work.
- C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.
- D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.
- E. All work shall comply with the applicable recommendations of:
 - 1. The National Board of Fire Underwriters
 - American Gas Association
 - 3. The National Fire Protection Association (NFPA)
 - 4. The Occupations Safety and Health Act (OSHA)
 - 5. Current IBC Building Code
 - 6. Current applicable city building codes.
- F. Mechanical: Conform to current mechanical code.
- G. Plumbing: Conform to current plumbing code.
- H. Obtain permits and request inspections from authority having jurisdiction.

1.04 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on the drawings unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.
- C. This contractor, before submitting his bid, shall visit the site of the project to familiarize himself with locations and conditions affecting his work.
- D. It is the intent of this specification that the contractor furnishes all labor and material required completing the installation as outlined in the drawings and specifications. No additions to the contract price shall be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.

- E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing piping, ductwork, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.
- F. This contractor shall provide holes as necessary for the installation of his work and in accordance with other specification sections in materials other than the structure.

1.05 SEQUENCING AND SCHEDULING

- A. This contractor shall arrange his work in order that it progresses along with the general construction of the building.
- B. This contractor shall be kept informed as to the work of other trades engaged in the project and shall execute his work in such a manner so as not to delay or interfere with progress of other contractors.
- C. Where space for mechanical and electrical lines and piping is limited, it is imperative that all such trades coordinate their work so as to insure concealment in space provided. Where conflict exists, the engineer shall decide priority of space. If work is not properly coordinated, the engineer may require removal and relocation of work without additional compensation.

1.06 GUARANTEE

- A. This contractor shall guarantee all of the apparatus, materials, equipment furnished and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.
- B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.
- C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at his own expense.

1.07 ENGINEER APPROVED EQUAL PRODUCTS

- A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.
- B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.
- C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".
- D. Similar products shall be all of the same manufacturers and style. There is no exception to this unless prior approval has been granted from engineer.

1.08 OWNER'S RIGHT OF SALVAGE

- A. Before beginning construction, this contractor shall check and verify with the owner each item of existing equipment that must be removed.
- B. The owner will designate which items of material or equipment not reused that he may wish to keep. The contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.

C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for his use shall become the property of the contractor and shall be removed from site.

1.09 PROTECTION AND MAINTENANCE

- A. Where necessary to connect to any existing utility service, this contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.
- B. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.
- C. This contractor shall protect existing equipment in finished areas from dirt, dust and damage as a result of his work.
- D. Coordinate protection requirements with department heads before beginning construction.
- E. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.10 DEMOLITION

- A. This contractor shall be responsible for the demolition and removal of all existing mechanical elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be relocated".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
 - 4. All elements to be removed are subject to the Owner's Right of Salvage.
- B. Preserve services to the existing facility. Extend/reroute/reconnect existing systems as required providing for the continued function of these systems.

1.11 TEMPORARY HEATING, VENTILATION, AND AIR CONDITIONING

- A. Coordinate provisions for temporary heating, cooling, ventilation, and/or dehumidification with the general contractor as required in Division 01.
- B. Coordinate temporary HVAC needs with LEED requirements as outlined in Division 01.
- Coordinate construction heating gas requirements with the utility company prior to the start of construction.
- D. If permanent HVAC units are to be operated prior to substantial completion, the mechanical contractor shall take steps as necessary to prevent construction dust and debris from entering the HVAC system and preserve the manufacturer's warranty.
 - 1. The general and mechanical contractors shall receive permission from the owner and architect in writing prior to operating the permanent HVAC equipment.
 - 2. At no point shall the permanent HVAC system be in operation during installation and sanding of drywall, grinding of floors, or any other construction activities that generate dust.
 - a. For existing systems that serve other spaces that must remain active, close off all supply, return, and exhaust grilles/diffusers in the space where dust-generating activities are taking place. Only after the dust has settled and the affected space has been cleaned can grilles/diffusers be put back into service.
 - 3. Install temporary filters with a minimum efficiency of MERV 8 on all return and/or exhaust grilles and louvers. Check filters on a weekly basis and replace as necessary and as directed by the owner or architect.
 - 4. Install temporary MERV 8 filters in all air handling equipment. Check filters on a weekly basis and replace as necessary and as directed by the owner or architect. Replace all filters after substantial completion with new filters.
 - 5. This contractor shall be responsible for any maintenance or warranty items prior to substantial completion if equipment is used for temporary space conditioning.

E. On projects with multiple phases, the contractor shall assist the owner in developing a filter checking and replacement schedule for areas that are complete. This shall be done to prevent construction dust from plugging filters in finished areas. The owner shall be responsible for providing replacement filters.

1.12 CUTTING AND PATCHING

- A. This contractor shall do all cutting and patching necessary for the installation of his work in all existing and new buildings unless otherwise noted.
- B. This contractor shall arrange for openings in the building as required for the installation of equipment furnished under this contract. Where ductwork or piping must be extended or changed, patching with concrete will be done in the building. Patching shall be at both the top and bottom of sleeves where above grade.
- C. In areas where the integrity of new or existing fire separation assembly/wall is compromised by the work, contractor shall be responsible to patch and/or seal openings as necessary to maintain/return fire separation to rating as required by applicable codes.
- D. This contractor shall do all cutting and patching required for his work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.13 CLEANING AND RUBBISH

- A. This contractor, upon completion of his work, shall remove all rubbish and debris resulting from his operation and shall remove it from site at his own expense.
- B. In so far as his work is concerned, all equipment shall be cleaned and the premises left in first class condition.
- C. This contractor shall maintain the work area each day to prevent hazardous accumulation of waste from his work.

1.14 SEALING AND PENETRATION

- A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.
- B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.
- C. Manufacturer offering products to comply with the requirements include the following:
 - 1. Dow Corning "Silicone RTV Foam"
 - 2. 3-M Corporation "Fire Barrier Caulk and Putty"
 - 3. Thomas & Betts "Flame Safe Fire Stop System"
- D. Installation of these products to be in strict accordance with manufacturer's recommendations and architectural specification sections or equivalent fire stopping architectural specification section.
- E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.15 ELECTRICAL CONNECTIONS

A. This contractor shall turn over all magnetic starters, thermal protective switches, and speed changing switches furnished under this contract for all motor driven equipment to the electrical contractor who will install such starters and switches and wire them to their respective motors as a part of the electrical contract.

1.16 UTILITY COMPANY

- A. Any fees by the utility company are to be billed directly to the owner.
- B. The contractor is required to assist the owner in the preparation of all utility company rebate forms that deal with equipment furnished and/or installed as a part of this contractor.

1.17 HAZARDOUS MATERIALS

- A. If the contractor stores any hazardous solvents or other materials on the site, he shall obtain copies of the safety data sheets for the materials and post them on the site. He shall inform the owner and all employed of any potential exposure to this material.
- B. At no time shall any product containing asbestos be incorporated into the work.
 - 1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.18 RECORD DRAWINGS

- A. This contractor shall provide at the conclusion of the project one clean, non-torn, neat, and legible "as-built" set of drawings to the owner. These drawings shall show the routing of pipes, ductwork and equipment drawn in at scaled locations. All dimensions indicated shall be referenced to a column line. A set of construction blue prints will be furnished for this work.
- B. All mechanical systems installed shall be shown on the "as-built" drawings. This includes all addendum items and change orders.
- C. Refer to respective architectural specification section for additional information.
- D. This contractor shall update these drawings during the project at least every week.

1.19 REVIEW OF MATERIALS

- A. This contractor shall submit to the engineer for review one (1) electronic copy giving a complete list of materials and equipment he proposes to furnish. The brochure shall contain complete information as to the make of equipment, type, size, capacities, dimensions and illustration. One of these returned copies shall be kept on the job at all times.
- B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless he notifies engineer in writing of such deviation at time such drawings are furnished.
- C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.
- D. This contractor shall mark the date and sign each set that he has checked each of them in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted, or checked and will be marked "resubmit" and sent back to the contractor.

1.20 TEST OF SYSTEMS

- A. This contractor, before concealed, shall test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.
- B. This contractor shall be held responsible for all damage resulting from defects in the system.
- C. At the conclusion of construction (before any covering up, painting or finishing) each element of the system shall be thoroughly tested against leakage, with appropriate pressure tests, as outlined herein and in appropriate sections of the specifications. All testing shall be hydrostatic unless permission is granted otherwise.
 - 1. Water: 100 psi maintained 8 hours
 - 2. Under Floor Pipes: 200 psi maintained 8 hours
- D. Fluid lines other than the above 1.5 times operating with a minimum pressure of 60 psig.
- E. After completion of installation, the systems shall be given tests under full operating conditions and pressures and all adjustments shall be made to make the system operative as required. All safety devices shall be tested for correct operation.

1.21 SCOPE OF WORK

- A. All work shall be performed by well-qualified and licensed mechanics with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that his mechanics are familiar with all the various codes and tests applicable to this work.
- B. All equipment shall be new and of the type as specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.
- C. The intent of the drawings and specifications is for complete installation of the systems outlined in the drawings and specifications so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation.
- D. This contractor shall be required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type. The drawings and specifications cannot deal individually with the many minute items that may be required by the nature of the systems.
- E. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer's attention and an addendum is issued for clarification.

1.22 VERIFICATION OF ELEVATION OF EXISTING LINES

A. This contractor shall before starting any new work, verify the elevations of all existing piping to which he must connect under this contract. He shall report any discrepancies between drawing elevations and actual elevations to the engineer before proceeding with the work. Failure of the contractor to do so shall make him liable for the cost of extra work involved.

1.23 WELDING PERMIT

A. Form titled "Permit For Cutting and Welding With Portable, Gas or Arch Equipment" must be completed and returned to the hospitals designated representative prior to work commencing. The owner, upon request, will supply this form.

1.24 DAILY HOUSEKEEPING

- A. At the end of each working day, this contractor shall remove all of his debris, rubbish, tools and surplus materials from the project work area. The work area shall be broom clean and left in a neat and orderly condition. The contractor for the removal of debris from the project shall not use the owner's waste disposal facility.
- B. At end of construction, all equipment shall be cleaned and the premises left in first class condition as far as this contractor's work is concerned.

1.25 OWNER'S RIGHT OF WORK CESSATION

- A. The owner reserves the right to order an immediate cessation of the work without giving advance notice.
- B. All work not directly affecting the owner's use and occupancy of the remodeled/new areas shall be performed between the hours of 7:00 am and 5:00 pm Monday through Friday.
- C. All work directly affecting the owner's use and occupancy of the remodeled area shall be performed between the hours of 5:00 pm and 7:00 am Monday through Friday. Weekend hours shall be as arranged with the owner.

1.26 CLEANING OF MECHANICAL SYSTEMS

A. The mechanical contractor shall clean and passivate all piping systems. Flush hydronic systems with water until free from all sand, grit, gravel, oil, etc. Provide Babcock/Wilcox Millipore and biological testing on the flush water. The flush will be considered a success when the water exiting the system contains less than 100 ppb of total suspended solids and less than 100 RLUs.

- B. Where connections are made to existing piping systems, this contractor shall provide isolation valves, threaded tees, etc., as required to facilitate the cleaning and testing of all new piping.
- C. This contractor shall thoroughly clean all rust, grease, plaster, cement, etc., from all equipment, ductwork and piping furnished and installed by him as required to leave surfaces suitable for finish painting.
- D. This contractor shall keep all pipes, ducts, etc., plugged, drained or otherwise protected during construction. All items of mechanical equipment shall be suitably protected and upon completion of project shall be equal to new condition.

1.27 TRENCHING AND BACKFILLING

- A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.
- B. Prior to digging, all underground utilities, piping, etc shall be exactly located and marked. This contractor shall be held responsible for all damages caused by failure to do so.
- C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.
- D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.
- E. Refer to architectural specification sections for additional requirements.

1.28 ALTERNATES

A. Refer to General Specification Sections for alternate bid description.

1.29 DIGITAL MEDIA AGREEMENT

- A. Computer Aided Drafting (CAD) documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.
- B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

1.30 SECURE NETWORKABLE DEVICES

- A. Update network devices to the most current software/firmware.
- B. Change default password of all networkable devices.
 - 1. Passwords shall have at least eight characters.
 - 2. Include uppercase and lowercase letters, numerals, and special characters
- C. Supply MAC address and serial number of all networkable devices.
- D. Work with the Owner's IT department to align to existing IT standards.
- E. Provide to the owner a printed and/or electronic spreadsheet log of all network information including, IP addresses, MAC addresses, logins and password information during system training.

1.31 COMMISSIONING REQUIREMENTS

- A. Contractor and their subcontractors and vendors shall assign representatives with expertise and authority to act on their behalf and schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - 1. Construction Phase:
 - a. Facilitate the coordination of the commissioning and incorporate commissioning activities (the Commissioning Plan) into the Overall Project Schedule (OPS).
 - b. Provide detailed startup procedures.
 - c. Ensure that all subcontractors and vendors execute their commissioning responsibilities according to the contract documents and the OPS.
 - d. Provide copies of all submittals as required in Section 01300 including all changes thereto. Attend and participate in commissioning team meetings.

- e. No later than 60 days prior to startup of the first piece of major equipment, meet with the CxA, CM, A/E, and PM and owner to finalize the detailed commissioning procedures/ schedule.
- f. Provide the training of owner personnel.
- g. Review and accept construction checklists provided by the commissioning authority.
- h. Complete paper construction checklists as work is completed and provide to the commissioning agent.
- i. Accomplish commissioning process test procedures.
- j. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
- k. Cooperate with the CxA for resolution of issues recorded in the "Issues Log".
- I. Prepare O & M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built/as-tested conditions.
- 2. Occupancy and Operations Phase
 - a. Ensure that subcontractors provide assistance for seasonal or deferred performance testing, performed by the CxA, according to the specifications.
 - b. Ensure that subcontractors correct deficiencies and make necessary adjustments to O & M manuals and as-built drawings for applicable issues identified in any seasonal testing.
 - c. Perform all guarantee work for materials furnished under the contract for the time specified in the contract, including all warranties and curing all latent defects within the time period provided in the contract.

B. Vendors / Subcontractors

- 1. Provide all requested submittal data, including detailed startup procedures and specific responsibilities of the owner to keep warranties in force.
- 2. Assist in equipment testing per agreements with subcontractors and/or contractor.
- 3. Include cost of all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing, operating, and maintaining equipment according to these contract documents in the base bid price to the contractor.
- 4. Analyze specified products and verify that the A/E has specified the newest, most current equipment reasonable for this project's scope and budget.
- 5. Provide requested information regarding equipment sequence of operation and testing procedures.
- 6. Review construction checklists and test procedures for equipment installed by factory representatives.

PART 2 PRODUCTS
NOT USED
PART 3 EXECUTION
NOT USED

SECTION 230090

MINOR HVAC DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements of the Contract Forms, the Conditions of the Contract, Division 1 - General Requirements and Specification Section 230050 - Basic Mechanical Requirements "General Provisions" apply to this section.

1.02 SCOPE

- A. This contractor shall be responsible for the demolition and removal of all existing mechanical elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be relocated".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
- B. Preserve services to the existing facility. Extend, reroute, and reconnect existing systems as required providing for the continued function of these systems.
- C. This contractor shall be responsible for the cutting and capping of all existing gas, water, sewer, and any other utility service.
- D. Demolition shall be accomplished by the proper tools and equipment for the work to be removed. Personnel shall be experienced and qualified in the type of work to be performed.
- E. This contractor shall remove all abandon equipment, piping, ductwork, supports, equipment curbs, and bases associated with the remodeled areas unless noted otherwise.
- F. This contractor is responsible to provide temporary HVAC protection during this project.

1.03 MATERIALS

- A. All elements to be removed are subject to the Owner's Right of Salvage.
- B. All materials removed shall be the property of the removing contractor and shall be removed from the site by him, unless otherwise specified.
- C. The owner may designate and have salvage rights to any material herein demolished by this contractor. The contractor shall coordinate with the owner prior to start of demolition.

1.04 WORK BY OTHERS

- A. Unless specifically noted under other contracts, this mechanical contractor shall assume he will perform all required work. In general, the following will be performed by others:
 - 1. The electrical contractor will disconnect all electrical service and remove conduit back to behind finished surfaces, close and cap ends of conduits.

1.05 EXISTING CONDITIONS

- A. If any piping serving existing fixtures or equipment (that are to remain) are disturbed by operations under this contract, this contractor shall provide pipe and insulation required to re-establish continuity of such piping systems.
- B. This contractor shall arrange for the general contractor to repair and patch all construction with material necessary to match surrounding due to the removal of equipment, piping, and ductwork.
- C. This contractor shall furnish all required labor and material, where required, to extend new work to connect to similar work for extension of existing systems.
- D. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to the owner before disturbing existing installation. Beginning of demolition means installer accepts existing conditions.

PART 2 PRODUCTS
NOT USED
PART 3 EXECUTION
NOT USED

SECTION 230529

HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe hangers and supports
- B. Accessories
- C. Flashing
- D. Equipment curbs
- E. Equipment bases
- F. Sleeves

1.02 RELATED SECTIONS

A. Specification Section 232300 - Refrigerant Piping

1.03 REFERENCES

- A. ASME B31.1 Power Piping
- B. ASME B31.2 Fuel Gas Piping
- C. ASME B31.5 Refrigeration Piping
- D. ASME B31.9 Building Services Piping
- E. ASTM F708 Design and Installation of Rigid Pipe Hangers
- F. MSS SP58 Pipe Hangers and Supports Materials, Design and Manufacturer
- G. MSS SP69 Pipe Hangers and Supports Selection and Application
- H. MSS SP89 Pipe Hangers and Supports Fabrication and Installation Practices

1.04 SUBMITTALS

- A. Product Data: Provide manufacturers catalog data including load capacity.
- B. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- C. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for support of piping.

PART 2 PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

- A. Manufacturers:
 - 1. Anvil International International
 - 2. Cooper B-Line/Tolco
 - 3. Engineer approved equal.
- B. Hydronic Piping:
 - 1. Conform to ASME B31.9; ASTM F708
 - 2. Hangers for Pipe Sizes 1/2" to 1-1/2": Carbon steel, adjustable swivel, split ring. Anvil International Figure 104.
 - 3. Hangers for Cold Pipe Sizes 2" and Over: Carbon steel, adjustable, clevis. Anvil International Figure 260.
 - 4. Hangers for Hot Pipe Sizes 2" to 4": Carbon steel, adjustable, clevis. Anvil International Figure 260.
 - 5. Hangers for Hot Pipe Sizes 6" and Over: Adjustable steel yoke, cast iron roll, single hanger. Anvil International Figure 181.

- 6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- 7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6" and Over: Steel channels with welded spacers and hanger rods, cast iron roll. Anvil International Figure 175.
- 8. Wall Support for Pipe Sizes to 3 Inches: Cast iron bracket. Anvil International Figure 213.
- 9. Wall Support for Pipe Sizes 4" and Over: Welded steel bracket and wrought steel clamp. Anvil International Figure 195.
- 10. Wall Support for Hot Pipe Sizes 6" and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll. Anvil International Figure 195 and 181.
- 11. Vertical Support: Steel riser clamp. Anvil International Figure 261.
- 12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support. Anvil International Figure 264.
- 13. Floor Support for Hot Pipe Sizes to 4": Cast iron adjustable pipe saddle, lock nut, nipple, floor flange and concrete pier or steel support. Anvil International Figure 264.
- 14. Floor Support for Hot Pipe Sizes 6" and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support. Anvil International Figure 274.
- 15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated. Anvil International Figure 97.
- 16. Provide zinc coated hangers and supports for all non air conditioned areas.
- 17. Provide aluminum hangers and supports in pool area.

C. Refrigerant Piping:

- 1. Conform to ASME B31.5 or ASTM F708.
- 2. Hangers for Pipe Sizes 1/2" to 1-1/2": Carbon steel adjustable swivel, split ring. Anvil International Figure 104.
- 3. Hangers for Pipe Sizes 2" and Over: Carbon steel, adjustable, clevis.
- 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- 5. Wall Support for Pipe Sizes to 3": Cast iron hook.
- 6. Wall Support for Pipe Sizes 4" and Over: Welded steel bracket and wrought steel clamp.
- 7. Vertical Support: Steel riser clamp.
- 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- 10. Exterior Support: Zinc coated Unistrut.

2.02 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end or continuous threaded.

2.03 FLASHING

- A. Metal Flashing: 26 gauge galvanized steel.
- B. Metal Counter Flashing: 22 gauge galvanized steel.
- C. Flexible Flashing: 47 mil thick sheet butyl compatible with roofing.
- D. Caps: Steel, 22 gauge minimum; 16 gauge at fire resistant elements.
- E. Provide curbs for mechanical roof installations 14 inch minimum high above roofing surface unless noted otherwise. Flash and counterflash with sheet metal and seal watertight. Attach counter flashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

2.04 EQUIPMENT CURBS

- A. Manufacturers:
 - 1. ThyCurb
 - 2. Engineer approved equal.
- B. Fabrication: Welded 18 gauge galvanized steel shell and base, mitered three inch (3") cant, variable step to match roof insulation, 1-1/2 inch thick, 3 lb/ft3 insulation, factory installed wood nailer.

2.05 EQUIPMENT BASES

A. Provide housekeeping pads of concrete, minimum four inch (4") thick and extending six inch (6") beyond supported equipment.

2.06 SLEEVES

- A. Sleeves for pipes through wall below grade shall be Schedule 40, two pipe diameters larger than pipe. Seal with Linkseal.
- B. Sleeves for pipes through non-fire rated floors shall be 18 gauge galvanized steel.
- C. Sleeves for pipes through non-fire rated beams, walls, footings, and potentially wet floors shall be Schedule 40 steel pipe or 18 gauge galvanized steel.
- D. Sleeves for pipes through fire rated and fire resistive floors and walls, and fire proofing to be a fire rated sleeve assembly including seals, UL listed.
- E. Stuffing and Firestopping Insulation: Fiberglass type, non-combustible per UL tested assembly type.
- F. Sealant Manufacturers:
 - 1. Dow Corning Silicone RTV Foam.
 - 2. 3-M Fire Barrier Caulk and Putty.
 - 3. Thomas & Betts Flame Safe Fire Stop System.
 - 4. Engineer approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.02 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- F. Support riser piping independently of connected horizontal piping.
- G. Provide copper plated hangers and supports for copper piping.
- H. Design hangers for pipe movement without disengagement of supported pipe.
- I. Support vertical piping every ten feet or on every floor.

3.03 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum four inch (4") thick and extending six inches (6") beyond all floor supported equipment.
- B. Provide templates, anchor bolts and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.04 FLASHING

- A. Provide flexible flashing and metal counter flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface unless noted otherwise. Flash and counterflash with sheet metal; seal watertight. Attach

counter flashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.

3.05 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floor one inch (1") above finished floor level. Caulk sleeves.
- D. Provide sleeves where piping penetrates floor, ceiling or wall fire rated assemblies. Close off space between pipe and adjacent work with fire stopping insulation and caulk.
- E. Provide close fitting metal collar or escutcheon covers at both sides of penetration. Install chrome plated steel escutcheons at finished surfaces and within cabinets.

3.06 SCHEDULES

HANGER ROD	MAX. HANGER SPACING	DIAMETER
Pipe Size	Feet	Inches
1/2 to 1-1/4	6.5	3/8
1-1/2 to 2	10.0	3/8
2-1/2 to 3	10.0	1/2
4 to 6	10.0	5/8
8 to 12	14.0	7/8
14 and Over	20.0	1

SECTION 230553

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates
- B. Tags
- C. Stencils
- D. Pipe markers
- E. Ceiling tacks
- F. Labels

1.02 REFERENCES

A. ASME A13.1 - Scheme for the Identification of Piping Systems

1.03 SUBMITTALS

- A. Submit list of wording, symbols, letter size, and color-coding for mechanical identification.
- B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Samples: Submit two tags, 1-1/2 inch in size.
- E. Samples: Submit two labels. 1.9" x 0.75" in size.
- F. Manufacturer's Instructions: Indicate installation instructions, special procedures, and installation.
- G. Project Record Documents: Record actual locations of tagged valves, include valve tag numbers.

PART 2 PRODUCTS

2.01 NAMEPLATES

A. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.02 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Information Tags: Clear plastic with printed "Danger, "Caution" or "Warning" and message; size 3-1/4" x 5-5/8" with grommet and self-locking nylon ties.
- D. Tag Chart: Typewritten letter size list in anodized aluminum frame plastic laminated.

2.03 STENCILS

- A. Stencils with Clean Cut Symbols and Letters of Following Size:
 - 1. Outside Diameter of Insulation or Pipe Up to 2 Inches: 1/2 inch high letters.
 - 2. Outside Diameter of Insulation or Pipe 2-1/2" to 6 Inches: One inch (1") high letters.
 - 3. Outside Diameter of Insulation or Pipe Over 6 Inches: 1-3/4 inch high letters.
 - 4. Ductwork and Equipment: 1-3/4 inch high letters.
- B. Stencil Paint: Semi-gloss enamel, colors and lettering size conforming to ASME A13.1.

2.04 PIPE MARKERS

A. Color and Lettering: Conform to ASME A13.1.

- B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have maximum sheet size with spring fastener.
- C. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6" W x by 4" mil thick, manufactured for direct burial service.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings indicating flow direction arrow and identification of fluid being conveyed.

2.05 CEILING TACKS

- A. Description: Steel with a 3/4 inch diameter color-coded head.
- B. Color Code as Follows:
 - 1. HVAC Equipment: Yellow.
 - 2. Fire Dampers/Smoke Dampers: Red.
 - 3. Plumbing Valves: Green.
 - 4. Heating/Cooling Valves: Blue.

2.06 LABELS

A. Description: Laminated Mylar, size 1.9" x 0.75" adhesive backed with printed identification.

PART 3 EXECUTION

3.01 PREPARATION

- A. De-grease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces for stencil painting.

3.02 INSTALLATION

- A. Install identifying devices after completion of coverings and painting.
- B. Install plastic nameplates with corrosive-resistant mechanical fasteners or adhesive.
- C. Install labels with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer. Apply paint primer before applying labels for unfinished canvas covering.
- D. Install tags using corrosion resistant chain. Number tags consecutively by location.
- E. Install underground plastic pipe markers six inch (6") to eight inch (8") below finished grade, directly above buried pipe.
- F. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify valves in main and branch piping with tags.
- I. Identify air terminal units and radiator valves with numbered tags.
- J. Tag automatic controls, instruments, and relays. Key to control schematic.
- K. Identify piping, concealed or exposed with plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure and at each obstruction. Identify on both sides of any wall.
- L. Identify ductwork with stenciled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit at each side of penetration of structure or enclosure and at each obstruction.
- M. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.
- N. Conform to owner's existing identification scheme. Verify with owner prior to bid.

SECTION 230593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems
- B. Measurement of final operating condition of HVAC systems

1.02 REFERENCES

- A. AABC National Standards for Total System Balance
- B. ADC Test Code for Grilles, Registers, and Diffusers
- C. ASHRAE 111 Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems
- D. NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems
- E. SMACNA HVAC Systems Testing, Adjusting, and Balancing

1.03 SUBMITTALS

- Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.
- B. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- C. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
- D. Submit draft copies of report for review prior to final acceptance of project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
- E. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- F. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty prior to commencing system balance.
- G. Test Reports: Indicate data on AABC National Standards for Total System Balance Forms.

1.04 PROJECT RECORD DOCUMENTS

A. Record actual locations of flow measuring stations, balancing valve, and rough setting.

1.05 QUALITY ASSURANCE

- A. Perform total system balance in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance.
- B. Maintain one copy of each document on site.

1.06 QUALIFICATIONS

A. Independent agency specializing in the testing, adjusting and balancing of systems specified in this section with minimum three years experience.

1.07 PRE-BALANCING CONFERENCE

A. Convene a conference one week prior to commencing work of this section.

1.08 SEQUENCING

A. Sequence work to commence after completion of systems and schedule completion of work before substantial completion of project.

1.09 SCHEDULING

A. Schedule and provide assistance in final adjustment and test of life safety system with the fire authority.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire, smoke, and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
 - 12. Hydronic systems are flushed, filled, and vented.
 - 13. Pumps are rotating correctly.
 - 14. Proper strainer baskets are clean and in place.
 - 15. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies noted during performance of services that prevents system balance.
- C. Beginning of work means acceptance of existing conditions.

3.02 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to the engineer to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

3.03 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within +/- 5% of design for supply systems and +/- 10% of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within + 10% and 5% of design to space. Adjust outlets and inlets in space to within +/- 10% of design.
- C. Hydronic Systems: Adjust to within +/- 10% of design.

3.04 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the owner.

F. Check and adjust systems approximately six months after final acceptance and submit report.

3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extent those adjustments do not create objectionable air motion or sound levels. Affect the volume control by duct internal devices (such as dampers and splitters).
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50% loading of filters.
- Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum airflow rate, full cooling, and at minimum airflow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inch positive static pressure.
- M. Check multi-zone units for motorized damper leakage. Adjust air qualities with mixing dampers set first for cooling, then heating, and then modulating.
- N. Set volume controller to airflow setting indicated for variable air volume system powered units. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- O. Adjust airflow switches for proper operation for water applications.

3.06 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow-metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

3.07 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing:
 - 1. Fire Pumps
 - 2. Sprinkler Air Compressors
 - 3. Electric Water Coolers
 - 4. Plumbing Pumps
 - 5. Steam Condensate Pumps
 - 6. Boiler Feed Water Pumps
 - 7. HVAC Pumps
 - 8. Water Tube Boilers
 - 9. Packaged Steel Water Tube Boilers

- 10. Packaged Steel Fire Tube Boilers
- 11. Plate and Frame Heat Exchangers
- 12. Water Source Heat Pumps
- 13. Water to Water Heat Pumps
- 14. Energy Recovery Units
- 15. Radiant Floor System
- 16. Forced Air Furnaces
- 17. Direct Fired Furnaces
- 18. Reciprocating Water Chillers
- 19. Air Cooled Water Chillers
- 20. Centrifugal Water Chillers
- 21. Absorption Water Chillers
- 22. Induced Draft Cooling Tower
- 23. Blow-through Cooling Tower
- 24. Air Cooled Refrigerant Condensers
- 25. Packaged Roof Top Heating/Cooling Units
- 26. Packaged Terminal Air Conditioning Units
- 27. Unit Air Conditioners
- 28. Computer Room Air Conditioning Units
- 29. Air Coils
- 30. Evaporative Humidifier
- 31. Sprayed Coil Dehumidifier
- 32. Terminal Heat Transfer Units
- 33. Induction Units
- 34. Air Handling Units
- 35. Fans
- 36. Air Filters
- 37. Air Terminal Units
- 38. Air Inlets and Outlets

B. Report Forms

- Title Page:
 - a. Name of Testing, Adjusting, and Balancing Agency
 - b. Address of Testing, Adjusting, and Balancing Agency
 - c. Telephone number of Testing, Adjusting, and Balancing Agency
 - d. Project Name
 - e. Project Location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractori. Project Altitude
 - i. Report Date
- 2. Summary Comments:
 - a. Design versus final performance.
 - b. Notable characteristics of system.
 - c. Description of systems operation sequence.
 - d. Summary of out door and exhaust flows to indicate amount of building pressurization.
 - e. Nomenclature used throughout report.
 - f. Test conditions.
- 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range

- f. Calibration date
- Electric Motors:
 - a. Manufacturer
 - b. Model/Frame
 - c. HP/BHP
 - d. Phase, voltage, amperage; nameplate, actual, no load
 - e. RPM
 - f. Service factor
 - g. Starter size, rating, heater elements
 - h. Sheave Make/Size/Bore
- 5. V-Belt Drive:
 - a. Identification/location
 - b. Required driven RPM
 - c. Driven sheave, diameter and RPM
 - d. Belt, size and quantity
 - e. Motor sheave diameter and RPM
 - f. Center to center distance, maximum, minimum, and actual
- 6. Pump Data:
 - a. Identification/number
 - b. Manufacturer
 - c. Size/Model
 - d. Impeller
 - e. Service
 - f. Design flow rate, pressure drop, BHP
 - g. Actual flow rate, pressure drop, BHP
 - h. Discharge pressure
 - i. Suction pressure
 - j. Total operating head pressure
 - k. Shut off, discharge and suction pressures
 - I. Shut off, total head pressure
- 7. Combustion Test:
 - a. Boiler manufacturer
 - b. Model number
 - c. Serial number
 - d. Fire rate
 - e. Over fire draft
 - f. Gas meter timing dial size
 - g. Gas meter time per revolution
 - h. Gas pressure at meter outlet
 - i. Gas flow rate
 - j. Heat input
 - k. Burner manifold gas pressure
 - I. Percent carbon monoxide (CO)
 - m. Percent carbon dioxide (CO2)
 - n. Percent oxygen (O2)
 - o. Percent excess air
 - p. Flue gas temperature at outlet
 - q. Ambient temperature
 - r. Net stack temperature
 - s. Percent stack loss
 - t. Percent combustion efficiency
 - u. Heat output
- 8. Air Cooled Condenser:
 - a. Identification/number

- b. Location
- c. Manufacturer
- d. Model number
- e. Serial number
- f. Entering DB air temperature, design and actual
- g. Leaving DB air temperature, design and actual
- h. Number of compressors
- Chillers:
 - a. Identification/number
 - b. Manufacturer
 - c. Capacity
 - d. Model number
 - e. Serial number
 - f. Evaporator entering water temperature, design and actual
 - g. Evaporator leaving water temperature, design and actual
 - h. Evaporator pressure drop, design and actual
 - i. Evaporator water flow rate, design and actual
 - j. Condenser entering water temperature, design and actual
 - k. Condensing pressure drop, design and actual
 - I. Condenser water flow rate, design and actual
- 10. Cooling Tower:
 - a. Tower identification/number
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Rated capacity
 - f. Entering air WB temperature, design and actual
 - g. Leaving air WB temperature, design and actual
 - h. Ambient air DB temperature
 - i. Condenser water entering temperature
 - j. Condenser water leaving temperature
 - k. Condenser water flow rate
 - I. Fan RPM
- 11. Heat Exchanger:
 - a. Identification/number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Model number
 - f. Serial number
 - g. Steam pressure, design and actual
 - h. Primary water entering temperature, design and actual
 - i. Primary water leaving temperature, design and actual
 - j. Primary water flow, design and actual
 - k. Secondary water entering temperature, design and actual
 - I. Secondary water leaving temperature, design and actual
 - m. Secondary water flow, design and actual
 - n. Secondary water pressure drop, design and actual
- 12. Cooling Coil Data:
 - a. Identification/Number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Air flow, design and actual

- f. Entering air DB temperature, design and actual
- g. Entering air WB temperature, design and actual
- h. Leaving air DB temperature, design and actual
- i. Leaving air WB temperature, design and actual
- j. Water flow, design and actual
- k. Water pressure drop, design and actual
- I. Entering water temperature, design and actual
- m. Leaving water temperature, design and actual
- n. Saturated suction temperature, design and actual
- o. Air pressure drop, design and actual
- 13. Heating Coil Data:
 - a. Identification/Number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Air flow, design and actual
 - f. Water flow, design and actual
 - g. Water pressure drop, design and actual
 - h. Entering water temperature, design and actual
 - i. Leaving water temperature, design and actual
 - j. Entering air temperature, design and actual
 - k. Leaving air temperature, design and actual
 - I. Air pressure drop, design and actual
- 14. Electric Heat Duct:
 - a. Manufacturer
 - b. Identification/Number
 - c. Location
 - d. Model number
 - e. Design kW
 - f. Number of stages
 - g. Phase, voltage, amperage
 - h. Test voltage (each phase)
 - i. Test amperage (each phase)
 - j. Air flow, specified and actual
 - K. Temperature rise, design and actual
- 15. Induction Unit Data:
 - a. Manufacturer
 - b. Identification/Number
 - c. Location
 - d. Model number
 - e. Size
 - f. Design air flow
 - g. Design nozzle pressure drop
 - h. Final nozzle pressure drop
 - i. Final air flow
- 16. Air Moving Equipment:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Arrangement/Class/Discharge
 - f. Air flow, specified and actual
 - g. Return air flow, specified and actual
 - h. Outside air flow, specified and actual

- i. Total static pressure (total external), specified and actual
- j. Inlet pressure
- k. Discharge pressure
- I. Sheave make/size/bore
- m. Number of belts/make/size
- n. Fan RPM
- 17. Return Air/Outside Air Data:
 - a. Identification/Location
 - b. Design air flow
 - c. Actual air flow
 - d. Design return air flow
 - e. Actual return air flow
 - f. Design outside air flow
 - g. Actual outside air flow
 - h. Return air temperature
 - i. Outside air temperature
 - j. Required mixed air temperature
 - k. Actual mixed air temperature
 - I. Design outside/return air ratio
 - m. Actual outside/return air ratio
- 18. Exhaust Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Air flow, specified and actual
 - f. Total static pressure (total external), specified and actual
 - g. Inlet pressure
 - h. Discharge pressure
 - i. Sheave Make/Size/Bore
 - j. Number of Belts/Make/Size
 - k. Fan RPM
- 19. Duct Traverse:
 - a. System zone/branch
 - b. Duct size
 - c. Area
 - d. Design velocity
 - e. Design air flow
 - f. Test velocity
 - g. Test air flow
 - h. Duct static pressure
 - i. Air temperature
 - j. Air correction factor
- 20. Duct Leak
 - a. Description of ductwork under test.
 - b. Duct design operating and pressure.
 - c. Duct design test static pressure.
 - d. Duct capacity, air flow.
 - e. Maximum allowable leakage duct capacity times leak factor
 - f. Test Velocity:
 - 1) Blower
 - 2) Orifice, tube size
 - 3) Orifice size
 - 4) Calibrated

- 5) Test static pressure
- 6) Test orifice differential pressure
- 7) Leakage
- 21. Air Monitoring Station Data:
 - a. Identification/location
 - b. System
 - c. Size
 - d. Area
 - e. Design velocity
 - f. Design air flow
 - g. Test velocity
 - h. Test air flow
- 22. Flow Measuring Station:
 - a. Identification
 - b. Location
 - c. Size
 - d. Manufacturer
 - e. Model number
 - f. Serial number
 - g. Design flow rate
 - h. Design pressure drop
 - i. Actual/final pressure drop
 - j. Actual/final flow rate
 - k. Station calibrated setting
- 23. Terminal Unit Data:
 - a. Manufacturer
 - b. Type, constant, variable, single, dual duct
 - c. Identification/number
 - d. Location
 - e. Model number
 - f. Size
 - g. Minimum static pressure
 - h. Minimum design air flow
 - i. Maximum design air flow
 - j. Maximum actual air flow
 - k. Inlet static pressure
 - I. Air temperature rise across reheat coil
- 24. Air Distribution Test Sheet:
 - a. Air terminal number
 - b. Room number/location
 - c. Terminal type
 - d. Terminal size
 - e. Area factor
 - f. Design velocity
 - g. Design air flow
 - h. Test (final) velocity
 - i. Test (final) air flow
 - . Percent of design air flow
- 25. Sound Level Report:
 - a. Location
 - b. Octave bands equipment off
 - c. Octave bands equipment on
- 26. Vibration Test:
 - a. Location of points:

- b. Fan bearing, drive end
- c. Fan bearing, opposite end
- d. Motor bearing, center (if applicable)
- e. Motor bearing, drive end
- f. Casing (bottom and top)
- g. Casing (side)
- h. Duct after flexible connection (discharge)
- i. Duct after flexible connection (suction)
- j. Test Readings:
 - 1) Horizontal, velocity and displacement
 - 2) Vertical, velocity and displacement
 - 3) Axial, velocity and displacement
 - 4) Normally acceptable readings, velocity and acceleration
 - 5) Unusual conditions at time of test
 - 6) Vibration source (if non-complying)

SECTION 230713 DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiberglass (flexible duct wrap)
- B. Fiberglass (duct liner)

1.02 RELATED SECTIONS

- A. Specification Section 233100 HVAC Ducts and Casings
- B. Specification Section 233300 Air Duct Accessories

1.03 REFERENCES

- A. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- B. ASTM C518 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- C. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
- D. ASTM C921 Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
- E. ASTM C1071 Standard Specification for Thermal and Acoustical Insulation (Fiberglass, Duct Lining Material)
- F. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
- G. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials
- H. ASTM E162 Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source
- ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- J. ASTM C612: Standard Specification for Mineral Fiber Block and Board Thermal Insulation
- K. ASTM C1290: Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts
- L. ASTM E2336: Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems
- M. ASTM C1338: Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
- N. NAIMA National Insulation Standards
- O. NFPA 255 Standard Method of Test of Surface Burning Characteristics of Building Materials
- P. SMACNA HVAC Duct Construction Standards Metal and Flexible
- Q. UL 723 Standard for Test for Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS

- A. Product Data: Provide product description, thermal characteristics, and list of materials and thickness for each service and locations.
- B. Manufacturer's Installation Instructions: Indicate procedures that ensure acceptable workmanship and installation standards will be achieved.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section approved by manufacturer.

1.06 REGULATORY REQUIREMENTS

- A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.
- B. Identification: External duct insulation and factory insulated flexible duct shall be legibly printed or identified at intervals not greater than 36 inch with name of manufacturer, the thermal resistance R-value at the specified thickness; and the flame spread and smoke developed indexes of the composite material.

1.07 DELIVERY, STORAGE AND PROTECTION

- A. Deliver, store, protect and handle products to site.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.
- Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 FIBERGLASS (FLEXIBLE DUCT WRAP)

- A. Manufacturers:
 - 1. Owens Corning
 - 2. Knauff
 - 3. Johns Manville
 - 4. CertainTeed
 - 5. Engineer approved equal.
- B. Insulation: ASTM C1290; flexible, noncombustible blanket.
 - 1. "K" Value: ASTM C518, 0.27 at 75 deg F.
 - 2. Installed R-value (compressed to 25%) for 1-1/2": 4.5
 - 3. Maximum Service Temperature: ASTM C411; 250 deg F.
 - 4. Maximum Moisture Absorption: ASTM C1104; 5% by weight
 - 5. Density: 1.0 lb./cu. ft. (0.75 lb/cu ft for attic insulation)
 - 6. Microbial Growth: ASTM C1338; does not support the growth of mold, fungi and bacteria.
 - 7. Maximum Flame Spread/Smoke Developed Index: ASTM E84; 25/50
- C. Vapor Barrier Jacket:
 - 1. Kraft paper reinforced with fiberglass yarn and bonded to aluminized film.
 - 2. Maximum Moisture Vapor Transmission: ASTM E96; 0.02 perm.
- D. Vapor Barrier Tape Pressure sensitive tape approved by the manufacturer.

2.02 FIBERGLASS (DUCT LINER)

- A. Manufacturers:
 - 1. Johns Manville Permacote Linacoustic
 - 2. Owens Corning
 - 3. CertainTeed Ultralite
 - 4. Knauff
 - 5. Engineer approved equal.
- B. Insulation:
 - 1. ASTM C1071, flexible noncombustible blanket air surface coated with acrylic coating treated with ASTM G21 and G22 anti-microbial agent to resist growth.
 - 2. "K" Value: ASTM C518, 0.25 at 75 deg F.
 - 3. Maximum Service Temperature: 250 deg F.

- 4. Maximum Velocity on Coated Air Side: 5,000 FPM
- Noise Reduction Coefficient: 0.50 or higher in accordance with ASTM C423. (1/2" thickness)
 - Noise reduction coefficient will drive density for each manufacturer may vary by manufacturer to achieve.
- 6. Maximum Flame Spread/Smoke Developed Index: ASTM E84; 25/50
- C. Adhesive: Adhesive: ASTM C916 adhesive as recommended by manufacturer.
- D. Liner Fasteners: Galvanized steel welded with integral head.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that ductwork has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed and dry.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Insulated Ductwork Conveying Air Below Ambient Temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, expansion joints, reheat coils, and any other item exposed to ductwork air temperature.
- C. Insulated Ductwork Conveying Air Above Ambient Temperature:
 - 1. Provide with standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. Exterior Ductwork Insulation Application:
 - 1. Secure insulation with vapor barrier with adhesive. Seal vapor barrier jacket joints with vapor barrier tape to match jacket.
 - 2. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging.
 - 3. Lift ductwork off trapeze hangers and insert spacers.
 - 4. Seal vapor barrier penetrations with vapor barrier adhesive and tape.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- E. Duct Liner Application:
 - 1. Adhere insulation with adhesive for 100% coverage.
 - 2. Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing. Pin length as required to limit compression of liner.
 - 3. Seal and smooth joints. Seal and coat all exposed edges.
 - 4. Seal liner surface penetrations with adhesive.

3.03 SCHEDULES

FIBERGLASS FLEXIBLE DUCT WRAP

DUCTWORK	THICKNESS
Supply Ducts	1-1/2"
Return Ducts	1-1/2"
Ductwork Exposed to Attic Space	3"
Exhaust	1-1/2"
Relief	1-1/2"
Outside Air Intake Duct	2"
Combustion Air	2"

Fire,	Smoke, and Fire/Smoke Damper Sleeves	1-1/2"
	VAV Box Reheat Coil Section	1-1/2"

FIBERGLASS DUCT LINER

DUCTWORK	THICKNESS
Supply Air Ducts	1/2"
Return Air Ducts	1/2"
Exhaust Air Ducts	1/2"
Relief	1/2"
Transfer Air Duct	1/2"

- A. Do not wrap or insulate any exposed supply, return or exhaust duct located in normally occupied areas.
- B. All kitchen hood exhaust ductwork shall be insulated with two layers of grease duct system wrap. When the duct penetrates fire rated walls or floors, provide UL classified fire stop system. Install per manufacturer recommendations.

SECTION 230719 HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible elastomeric cellular insulation (Chilled, refrigerant)

1.02 RELATED SECTIONS

- A. Specification Section 232113 Hydronic Piping
- B. Specification Section 232213 Steam and Steam Condensate Piping
- C. Specification Section 232300 Refrigerant Piping

1.03 REFERENCES

- A. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
- B. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- C. ASTM C177 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus
- D. ASTM C195 Standard Specification for Mineral Fiber Thermal Insulating Cement
- E. ASTM C240 Standard Test Methods of Testing Cellular Glass Insulation Block
- F. ASTM C449/C449M Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
- G. ASTM C518 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- H. ASTM C533 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
- I. ASTM C534 Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
- J. ASTM C547 Standard Specification for Mineral Fiber Preformed Pipe Insulation
- K. ASTM C552 Standard Specification for Cellular Glass Thermal Insulation
- L. ASTM C578 Standard Specification for Preformed, Cellular Polystyrene Thermal Insulation
- M. ASTM C591 Standard Specification for Unfaced Preformed Rigid Cellular Polyurethane Thermal Insulation
- N. ASTM C610 Standard Specification for Expanded Perlite Block and Pipe Thermal Insulation
- O. ASTM C795 Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
- P. ASTM C921 Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
- Q. ASTM D1056 Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
- R. ASTM D1667 Standard Specification for Flexible Cellular Materials Vinyl Chloride Polymers and Copolymers
- S. ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- T. ASTM D2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics
- U. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
- V. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials
- W. NAIMA National Insulation Standards
- X. NFPA 255 Standard Method of Test of Surface Burning Characteristics of Building Materials

Y. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials

1.04 SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials, and thickness for each service and locations.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

 Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

1.07 DELIVERY, STORAGE, AND PROTECTION

 Accept materials on site, labeled with manufacturer's identification, product density and thickness.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:
 - 1. Armacell: AP Armaflex
 - 2. Aerocel
 - 3. K-flex
 - 4. Engineer approved equal.
- B. Insulation: ASTM C534 flexible cellular elastomeric molded foam
- C. "K" Value: ASTM C177 or C518; 0.27 at 75 deg F.
- D. Minimum Service Temperature: -40 deg F.
- E. Maximum Service Temperature: 220 deg F.
- F. Maximum Moisture Absorption: ASTM D1056, 5.0% by weight gain
- G. Maximum Water Vapor Permeability: ASTM E96; 0.05 perm-in
- H. Maximum Flame Spread: ASTM E84; 25
- I. Maximum Smoke Developed: ASTM E84; 25
- J. Insulated Pipe Hangers: Refer to the requirements for elastomeric insulation contained in the Inserts and Shields portion of this section.
- K. Elastomeric Foam Adhesive:
 - Manufacturers:
 - a. Armstrong #BLV 520
 - b. Halstead/K-Flex
 - c. Aeroflex
 - d. Engineer approved equal.
 - 2. Air-dried contact adhesive, compatible with insulation
 - 3. VOC Content: 0 g/L as calculated and reported by SCAQMD 1168

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry with foreign material removed.

3.02 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated Dual Temperature Pipes or Cold Pipes Conveying Fluids Below Ambient Temperature:
 - 1. Provide vapor barrier jackets, factory applied or field applied.
 - 2. Insulate fittings, joints and valves with molded insulation of like material and a thickness as adjacent pipe.
 - 3. PVC fitting covers may be used.
 - 4. Continue insulation through walls (unless in firewall sleeves), pipe hangers and other pipe penetrations.
 - 5. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
 - 6. Vapor seal insulation ends every 20 feet.
- D. Insulated Pipes Conveying Fluids Above Ambient Temperature:
 - 1. Provide standard jackets with vapor barrier, factory applied.
 - 2. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe.
 - 3. PVC fitting covers may be used.
 - 4. Hot piping conveying fluids 140 deg F or less do not insulate flanges and unions at equipment, but level and seal ends of insulation.
 - 5. Hot piping conveying fluids over 140 deg F, insulate flanges and unions at equipment.

E. Inserts and Shields:

- 1. Manufacturers:
 - a. Jeff Company/Buckaroo
 - b. Armacell
 - c. Cooper/Eaton
 - d. TPS
 - e. Engineer approved equal.
- 2. Shields: Galvanized saddle with flared edges between pipe hangers or pipe hanger rolls and inserts.
- 3. Insert Location: Between support shield and piping and under the vapor barrier and finish iacket.
- 4. Insert Configuration: Minimum six inch (6") long of same thickness and contour as adjoining insulation; may be factory fabricated.
- 5. Insert Type:
 - a. Polystyrene and Fiberglass Insulation: 360 degree polyisocyanurate or phenolic foam cylindrical insert capable of supporting piping system. Pre-fabricated, insulated and jacketed supports are acceptable. Blocks, plugs, or wood material are not acceptable.
 - b. Closed Cell (Elastomeric) Insulation: Pre-fabricated 360 degree insulated pipe hanger with polyethylene inserts (Armacell "Armafix" or equal). Match thickness of pipe insulation. Hanger shall have PVC or aluminum jacket. Provide friction tape on inside of pipe clamp/support to avoid slipping.
- F. Insulation shall be continuous at all hangers. Hanger shall not be in direct contact with pipe.
- G. Heat traced piping insulate fittings, joints and valves with insulation of like material, thickness and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10% at normal conditions, as materials indicate.

3.04 SCHEDULE

FIBERGLASS INSULATION FLEXIBLE ELASTOMERIC FOAM INSULATION

PIPING SYSTEMS	PIPE SIZE	THICKNESS
Chilled Water Supply/Return	Less than 6"	1"
Chilled Water Supply/Return	6" and larger	1.5"
Geothermal Supply/Return	Less than 6"	1"
Geothermal Supply/Return	6" and larger	1.5"
Heating Supply/Return	Less than 1.5"	1.5"
Heating Supply/Return	1.5" and larger	2"
Pump Bodies, Valves, and Devices:	ALL	0.75"
Condenser Water:	NONE	
Cooling Coil Condensate Drains:	ALL	1"
Refrigerant Suction Lines:	ALL	1"
Refrigerant Liquid Lines:	ALL	1"
Refrigerant Hot Gas Bypass Lines:	ALL	0.75"
VRF Liquid Lines:	ALL	1"
VRF Gas Lines (Low and High Pressure):	ALL	1"

- A. Note: Pre-insulated refrigerant piping from the manufacturer shall be approved for use.
- B. Note: Refer to VRF manufacturer installation instructions for more stringent requirements.

SECTION 231123 NATURAL GAS PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Natural gas piping
- B. Gas control vents
- C. Flanges, unions, and couplings
- D. Gas pressure regulators
- E. Plug valves
- F. Gas ball valves

1.02 REFERENCES

- A. ASHRAE 90A Energy Conservation in New Building Design
- B. ASME Section 8D Pressure Vessels
- C. NFPA 30 Flammable and Combustible Liquids Code
- D. NFPA 54 National Fuel Gas Code
- E. NFPA 70 National Electrical Code

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three-years experience.
- B. Provide Welder's Certificate: Include Welder's Certification of Compliance with ASME Section IX.

1.04 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver, store, protect and handle products to the site.
- B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 NATURAL GAS PIPING (ABOVE GRADE)

- A. Steel Pipe:
 - 1. ASTM A53 Schedule 40 black.
 - 2. Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.
 - 3. Joints: NFPA 54, threaded or welded to ANSI B31.1.

2.02 GAS CONTROL VENTS

A. All gas control vents shall be vented separately to the exterior of the building. Terminate with screwed vent cap.

2.03 FLANGES, UNION, AND COUPLINGS

- A. Pipe Size Under 2 Inches:
 - 1. Ferrous Pipe: Class 150 psig malleable iron threaded unions.
 - 2. Copper Tube and Pipe: Class 150 psig bronze unions with soldered joints.
- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, and water impervious isolation barrier.

2.04 GAS PRESSURE REGULATORS

A. Manufacturers:

- 1. Fisher
- 2. Engineer approved equal.
- B. Direct-operated, spring-loaded regulator with internal relief. Regulator shall have internal relief across diaphragm to minimize overpressure. Any outlet pressure above the start-to-discharge point of the nonadjustable relief valve spring shall be allowed to bleed out through a relief vent.

2.05 PLUG VALVES

- A. Up To and Including 2 Inches:
 - Manufacturers:
 - a. Homestead Valve #612
 - b. Engineer approved equal.
 - Full port body, lubricated plug type, without taper, close tolerance between plug and body sealing surfaces, Teflon reinforced stem seal, leak-proof spring loaded check valve, combination lubricant screw and button head. Valve plugs shall be floated on low-friction Teflon surfaces. Lubricant system shall have sufficient pressure to force lubricant over all seating surfaces.
 - 3. Valves shall handle natural gas at temperature and pressure indicated.

2.06 GAS BALL VALVES

- A. Up To and Including 2 Inches:
 - 1. Manufacturers:
 - a. Apollo #80-100
 - b. Watts #B-6000-UL
 - c. Nibco #T-580-70-UL
 - d. Engineer approved equal.
 - 2. Bronze two piece full port body, chrome plated ball, Teflon seats and stuffing box ring, lever handle, threaded ends.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Where CSST is used, the contractor shall have the tubing manufacturer provide sizing information to ensure the proper equivalent hydraulic diameter is provided.
- B. This contractor shall furnish all labor and material necessary to install gas piping to all items of equipment shown on the drawings as requiring gas.
- C. Accessible piping smaller than two inch (2") may be screwed.
- D. All concealed gas pipe and all gas piping two inch (2") and larger shall be fabricated using weld type fittings.
- E. All steel gas piping buried in earth shall be Schedule 40 black steel mill wrapped and all joints shall be welded.
- F. Underground joints shall be wrapped with Minnesota Mining and manufacturing Scotchwrap.
- G. All gas piping shall be tested at 50-psi air pressure for a 24-hour period.
- H. This contractor shall furnish and install a gas cock shut off in the branch line to each gas-consuming piece of equipment. Provide plug valves where noted on the plans.
- I. This contractor shall begin at the meter and shall run gas piping to all gas using equipment as shown on the drawings.
- Verify all piping regulations and regulators required with local gas company before running gas lines.
- K. All gas piping that is run exposed to weather shall be given two coats of rust resisting paint.
- All gas piping in trenches, tunnels and concealed above inaccessible ceilings shall be welded construction.
- M. All gas piping carrying 1 psig or more shall be welded.

3.02 GAS REVISIONS

- A. The present natural gas service shall remain in its' present location. This contractor shall connect to the present gas manifold and shall re-work manifold as required.
- B. Provide new natural gas service. Coordinate equipment and installation requirements with local utility company. Verify requirements prior to bid.
- C. Any charges by the gas utility company to provide service to the building shall be included in this contractor's bid.
- D. The gas line shall run and be connected to all the new natural gas loads to include new AHU's, new water heaters and new kitchen.
- E. The present natural gas service to the existing building shall be disconnected and removed to the meter.
- F. Gas mains run over roof shall be supported on 4' x 4' sleepers, roof products, corps supports, or plastic molded roof support devices.
- G. Coordinate construction heating gas requirements with utility company prior to start of construction.

SECTION 232300 REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping
- B. Refrigerant
- C. Moisture and liquid indicators
- D. Valves
- E. Check valves
- F. Ball valves
- G. Service valves
- H. Strainers
- I. Filter-drier
- J. Solenoid valves
- K. Expansion valves
- L. Electronic expansion valves
- M. Receivers
- N. Flexible connections

1.02 RELATED SECTIONS

- A. Specification Section 235400 Furnaces
- B. Specification Section 23 8126 Ductless Split System Units
- C. Specification Section 238216 Air Coils

1.03 REFERENCES

- A. ARI 495 Refrigerant Liquid Receivers
- B. ARI 710 Liquid Line Dryers
- C. ARI 730 Flow-Capacity Rating and Application of Suction-Line Filters and Filter-Driers
- D. ARI 750 Thermostatic Refrigerant Expansion Valves
- E. ARI 760 Solenoid Valves for use with Volatile Refrigerants
- F. ASHRAE 15 Safety Code for Mechanical Refrigeration
- G. ASHRAE 34 Number Designation of Refrigerants
- H. ASME Boiler and Pressure Vessel Codes, SEC 9 Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators
- ASME B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- J. ASME B16.26 Cast Copper Alloy Fittings For Flared Copper Tubes
- K. ASME B31.5 Refrigeration Piping
- L. ASME B31.9 Building Services Piping
- M. ASME SEC 8D Boilers and Pressure Vessels Code, Rules for Construction of Pressure Vessels
- N. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- O. ASTM A234 Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
- P. ASTM B88 Seamless Copper Water Tube

- Q. ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
- R. ASTM F708 Design and Installation of Rigid Pipe Hangers
- S. AWS A5.8 Brazing Filler Metal
- T. AWS D1.1 Structural Welding Code, Steel
- U. MSS SP58 Pipe Hangers and Supports Materials, Design and Manufacturer
- V. MSS SP69 Pipe Hangers and Supports Selection and Application
- W. MSS SP89 Pipe Hangers and Supports Fabrication and Installation Practices
- X. UL 429 Electrically Operated Valves.

1.04 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASTM B31.5 unless indicated otherwise.
- C. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. If receiver is provided, install in liquid line leaving receiver.
 - 3. Use line size on leaving side of liquid solenoid valves.

D. Valves:

- 1. Use service valves on suction and discharge of compressors.
- 2. Use gauge taps at compressor inlet and outlet.
- 3. Use gauge taps at hot gas bypass regulators, inlet and outlet.
- 4. Use check valves on compressor discharge.
- 5. Use check valves on condenser liquid lines on multiple condenser systems.
- E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:

- 1. Use line size strainer upstream of each automatic valve.
- 2. Use single main liquid line strainer where multiple expansion valves with integral strainers are used.
- 3. Use strainer in suction line on steel piping systems.
- 4. Use shut-off valve on each side of strainer.
- G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.
- H. Permanent Filter-Drier:
 - 1. Use in low temperature systems.
 - 2. Use in systems utilizing hermetic compressors.
 - 3. Use filter-drier for each solenoid valve.
- I. Replaceable Cartridge Filter-Drier:
 - 1. Use vertically in liquid line adjacent to receivers.
 - 2. Use filter-drier for each solenoid valve.
- J. Solenoid Valves:
 - 1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
 - 2. Use in liquid line of single or multiple evaporator systems.
 - 3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

K. Receivers:

1. Use on systems 5 tons (18 kW) and larger, sized to accommodate pump down charge.

- Use on systems with long piping runs.
- L. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.05 SUBMITTALS

- Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- B. Product Data: Provide general assembly of specialties, including manufacturers catalog information. Provide manufacturers catalog data including load capacity.
- C. Design Data: Submit design data indicating pipe sizing. Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- D. Test Reports: Indicate results of leak test, acid test.
- E. Manufacturer's Installation Instructions: Indicate support, connection requirements and isolation for servicing.
- F. Submit Welder's Certification of Compliance with ASME SEC 9.

1.06 PROJECT RECORD DOCUMENTS

Record exact locations of equipment and refrigeration accessories on record drawings.

1.07 OPERATION AND MAINTENANCE DATA

A. Maintenance Data: Include instructions for changing cartridges, assembly views, and spare parts lists.

1.08 QUALIFICATIONS

- A. Installer: Company specializing in performing the work of this section with minimum three years experience.
- B. Design piping system under direct supervision of a professional engineer experienced in design of this work and licensed in Iowa.

1.09 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 for installation of piping system.
- B. Welding Materials and Procedures: Conform to ASME SEC 9 and applicable state labor regulations.
- C. Welder's Certification: In accordance with ASME SEC 9.
- D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Architectural Specification.
- B. Deliver and store piping and specialties in shipping containers with labeling in place.
- C. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- D. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

1.11 MAINTENANCE MATERIALS

- A. Provide two refrigeration oil test kits each containing everything required to conduct one test.
- B. Provide two filter-dryer cartridges of each type.

PART 2 PRODUCTS

2.01 PIPING

A. Copper Tubing: ASTM B280, type #ACR hard drawn or annealed.

- 1. Fittings: ASME B16.22 wrought copper.
- Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range of 1190 to 1480 deg F.
- B. Copper Tubing to 7/8 inch OD: ASTM B88, type #K, annealed.
 - 1. Fittings: ASME B16.26 cast copper.
 - 2. Joints: Flared.

2.02 REFRIGERANT

A. Refrigerant: ASHRAE 134A

2.03 MOISTURE AND LIQUID INDICATORS

- A. Manufacturers:
 - 1. Parker
 - 2. Engineer approved equal.
- B. Indicators: Double port type, UL listed with brass body, solder ends, sight glass, color coded paper moisture indicator and plastic cap; for maximum working pressure of 500 psig and maximum temperature of 200 deg F.

2.04 VALVES

- A. Manufacturers:
 - 1. Parker
 - 2. Engineer approved equal.
- B. Diaphragm Packless Valves: UL listed, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and hand wheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive back seating; for maximum working pressure of 500 psig and maximum temperature of 275 deg F.
- C. Packed Angle Valves: Forged brass, forged brass seal caps with copper gasket, rising stem and seat, molded stem packing, solder or flared ends; for maximum working pressure of 500 psig and maximum temperature of 275 deg F.

2.05 CHECK VALVES

- A. Globe Type:
 - 1. Manufacturers:
 - a. Parker
 - b. Engineer approved equal.
- B. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, Teflon seat disc; for maximum working pressure of 500 psig and maximum temperature of 300 deg F.
- C. Straight through type brass body and disc, phosphor-bronze or stainless steel spring, neoprene seat; for maximum working pressure of 500 psig and maximum temperature of 250 deg F.

2.06 BALL VALVES

- A. Manufacturers:
 - 1. Aurora
 - 2. Parker
 - 3. Alco
 - 4. Engineer approved equal.
- B. Two piece forged brass body with Teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psig and maximum temperature of 300 deg F.

2.07 SERVICE VALVES

- A. Manufacturers:
 - 1. Parker
 - 2. Alco

- 3. Engineer approved equal.
- B. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends for maximum pressure of 500 psig.

2.08 STRAINERS

- A. Manufacturers:
 - 1. Parker
 - 2. Alco
 - 3. Engineer approved equal.
- B. Straight line or angle line type brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psig.
- C. Straight line, non-cleanable type steel shell, copper plated fittings, stainless steel wire screen for maximum working pressure of 500 psig.

2.09 FILTER-DRIER

- A. Replaceable Cartridge Angle Type Manufacturers:
 - 1. Parker
 - 2. Alco
 - 3. Engineer approved equal.
- B. Permanent Straight Through Type: ARI 710, UL listed, steel shell with molded desiccant filter core, for maximum working pressure of 500 psig.
- C. Rating: ARI 710 moisture rating.

2.10 SOLENOID VALVES

- A. Manufacturers:
 - 1. Parker
 - 2. Alco
 - 3. Engineer approved equal.
- B. Valve: ARI 760, pilot operated, copper or brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly, integral strainer with flared, solder or threaded ends; for maximum working pressure of 500 psig.
- C. Stem shall permit manual operation in case of coil failure.
- D. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.11 EXPANSION VALVES

- A. Manufacturers:
 - 1. Parker
 - 2. Alco
 - 3. Engineer approved equal.
- B. Angle or Straight Through Type: ARI 750; design suitable for refrigerant, brass body, internal or external equalizer, adjustable super heat setting, replaceable inlet strainer with replaceable capillary tube and remote sensing bulb.
- C. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum of 10 deg F super heat. Select to avoid being undersized at full load and excessively oversized at part load.

2.12 ELECTRONIC EXPANSION VALVES

- A. Manufacturers:
 - 1. Parker
 - 2. Alco

3. Engineer approved equal.

B. Valve:

1. Brass body with solder connection, needle valve with floating needle and machined seat, and stepper motor drive.

C. Evaporation Control System:

1. Electronic microprocessor based unit in enclosed case, proportional integral control with adaptive super heat, maximum operating pressure function, pre-selection allowance for electrical defrost and hot gas bypass.

D. Refrigeration System Control:

 Electronic microprocessor based unit in enclosed case with proportional integral control of valve, on/off thermostat, air temperature alarm (high and low), solenoid valve control, liquid injection adaptive super heat control, maximum operating pressure function, night setback thermostat, and timer for defrost control.

2.13 RECEIVERS

- A. Manufacturers:
 - Parker
 - 2. Alco
 - 3. Engineer approved equal.
- B. Internal Diameter Six Inches (6") and Smaller: ARI 495, UL listed, steel, brazed; 400 psig maximum pressure rating with tappings for inlet, outlet, and pressure relief valve.
- C. Internal Diameter Over 6 Inches: ARI 495, welded steel, tested and stamped in accordance with ASME SEC 8D; 400 psig with tappings for liquid inlet and outlet valves, pressure relief valve, and magnetic liquid level indicator.

2.14 FLEXIBLE CONNECTORS

- A. Manufacturers:
 - 1. Parker
 - 2. Alco
 - 3. Engineer approved equal.
- B. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum nine inches (9") long with copper tube ends; for maximum working pressure 500 psig.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install refrigeration specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner with plumbing parallel to building structure and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations and locations. Slope piping 1% in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints or connected equipment.
- F. Arrange piping to return oil to compressor. Provide traps and loops in piping and provide double risers as required. Slope horizontal piping 0.40% in direction of flow. Pipe size to be provided by unit manufacturer.
- G. Provide clearance for installation of insulation and access to valves and fittings.

- H. Provide access to concealed valves and fittings. Coordinate size and location of access doors.
- Flood piping system with nitrogen when brazing.
- J. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- K. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting.
- L. Insulate piping and equipment.
- M. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.
- N. Provide replaceable cartridge filter-drier with isolation valves and valved bypass.
- O. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- P. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- Install flexible connectors at right angles to axial movement of compressor parallel to crankshaft.
- R. Fully charge completed system with refrigerant after testing.
- S. Provide electrical connection to solenoid valves.
- T. Evacuate system to 27 inches vacuum and hold at that level for 1 hour prior to charging system with refrigerant.

3.03 FIELD QUALITY CONTROL

- Field inspection and testing will be performed under provisions of Architectural Specification Sections.
- B. Test refrigeration system in accordance with ASME B31.5.
- C. Pressure test system with dry nitrogen to 200 psig. Perform final tests at 27 inches vacuum and 200 psig using electronic leak detector. Test to no leakage.

SECTION 233100 HVAC DUCTS AND CASING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Materials
- B. Ductwork fabrication
- C. Manufactured ductwork and fittings
- D. Casing
- E. Exposed spiral ductwork

1.02 RELATED SECTIONS

- A. Specification Section 230593 Testing, Adjusting, and Balancing for HVAC
- B. Specification Section 230713 Duct Insulation.
- C. Specification Section 233300 Air Duct Accessories.
- D. Specification Section 233600 Air Terminal Units.
- E. Specification Section 233700 Air Outlets and Inlets.

1.03 REFERENCES

- A. ASTM A 36 Structural Steel
- B. ASTM A 90 Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
- C. ASTM A 167 Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- D. ASTM A 366 Steel, Sheet, Carbon, Cold Rolled, Commercial Quality
- E. ASTM A 480 General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
- F. ASTM A 525 General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- G. ASTM A 527 Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality
- H. ASTM A 568 Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled
- ASTM A 569 Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
- J. ASTM B209 Aluminum and Aluminum-Alloy Sheet and Plate
- K. ASTM C14 Concrete Sewer, Storm Drain, and Culvert Pipe
- L. ASTM C443 Joints for Circular Concrete Sewer and Culvert Pipe, using Rubber Gaskets
- M. AWS D9.1 Welding of Sheet Metal
- N. NBS PS 15 Voluntary Product Standard for Custom Contact-Molded Reinforced-Polyester Chemical Resistant Process Equipment
- O. NFPA 90A Installation of Air Conditioning and Ventilating Systems
- P. NFPA 90B Installation of Warm Air Heating and Air Conditioning Systems
- Q. NFPA 91 Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying
- R. NFPA 96 Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment
- S. SMACNA HVAC Air Duct Leakage Test Manual
- T. SMACNA HVAC Duct Construction Standards Metal and Flexible

U. UL 181 - Factory-Made Air Ducts and Connectors

1.04 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.05 SUBMITTALS

- A. Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration prior to start of work for four inch (4") pressure class and higher and kitchen hood exhaust systems.
- B. Product Data: Provide data for duct materials, duct liner, and duct connectors.

1.06 PROJECT RECORD DOCUMENTS

A. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.07 QUALITY ASSURANCE

- Perform work in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible.
- B. Maintain one copy of document on site.

1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three-years experience.
- B. Installer: Company specializing in performing the work of this section with minimum three-years experience.

1.09 REGULATORY REQUIREMENTS

A. Construct ductwork to NFPA 90A Standards.

1.10 ENVIRONMENTAL REQUIREMENTS

- Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealants.

1.11 WARRANTY

A. Pre-insulated weatherproof exterior ductwork shall have a 10 year warranty.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Galvanized Steel Ducts: ASTM A924 and ASTM A653 galvanized steel sheet, lock-forming quality, having zinc coating of in conformance with ASTM A90.
- B. Steel Ducts: ASTM A366, A569, and A568.
- C. Insulated Flexible Duct
 - Manufacturers:
 - a. Thermaflex G-KM
 - b. Flexmaster
 - c. Atco
 - d. Engineer approved equal.
 - 2. UL 181, Class 1, NFPA 90A and 90B compliant, interlocking spiral of steal wire, fiberglass insulation with R value of 4.2 or greater; core shall be chlorinated polyethylene vapor barrier film. (Polyester is not acceptable). Outer shell/vapor barrier shall be metalized polyester or polyethylene film.
 - 3. Pressure Rating: Six inch (6") positive and one inch (1") negative.

- 4. Maximum Velocity: 5000 fpm.
- 5. Temperature Range: -20 to 180 deg F.
- 6. Vapor Transmission: 0.1 perms or less (ASTM E96)
- 7. Flex Elbows: Flex duct 90 degree elbow splines for connections to diffusers. Flex elbows shall prevent kinks in flex duct. Elbow spline shall be UL-2043 listed for use in plenums.
- D. Fasteners: Rivets, bolts or sheet metal screws.
- E. Duct Sealant
 - 1. Manufacturers:
 - a. Design Polymerics (DP1010)
 - b. Ductmate
 - c. Durodvne
 - d. Engineer approved equal.
 - 2. Description: Water based, non hardening, high velocity/high pressure duct sealant intended for indoor and outdoor HVAC ducts.
 - 3. Pressure Rating: 10" water column minimum.
 - 4. Service Temperature: -20 to 200F
 - 5. Listings
 - a. ASTM E-84/UL723 Flame/Smoke Spread: 25/50 or less.
 - b. UL-181B listed for use on Flex Duct connections.
 - c. Conforms to NFPA 90A & 90B requirements.
 - d. Approved for use on interior of ducts.
 - 6. VOC Content
 - a. 0 g/L
 - b. CDPH Standard Method v1.1 (14 days): Less than 5.0 mg/m3.
- F. Hanger Rod: ASTM A36; steel, galvanized; threaded both ends, threaded one end.

2.02 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing and sealing for operating pressures indicated.
- B. Increase duct sizes gradually, not exceeding 15 degree divergence wherever possible; maximum 30 degree divergence upstream of equipment and 45 degree convergence downstream.
- C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with fiberglass insulation.
- D. Fabricate continuously welded round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Joints shall be minimum four inch (4") cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45 degree lateral wye takeoffs or 90 degree conical tee takeoffs.
- F. Fabricate all exposed ductwork using paint grip galvanized sheet metal.
- G. All outside air intake or relief ductwork above finished areas shall be caulked to be watertight. An auxiliary continuous drain pan shall be provided beneath these ducts to prevent damage in case of a waterproofing failure. Line this drain pan with 1/2 inch duct liner and turn up all edges.

2.03 MANUFACTURED DUCTWORK AND FITTINGS

- A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
- 3. Round Ducts: Machine made from round spiral lock seam duct with light reinforcing corrugations, fittings manufactured at least two gauges heavier metal than duct.

- C. Double Wall Insulated Round Ducts: Machine made from round spiral lock seam duct with light reinforcing corrugations, galvanized steel outer wall, one inch thick anti-microbial fiberglass insulation, perforated galvanized steel inner wall; fittings manufactured with solid inner wall.
- D. PVC Coated Steel Ducts: UL 181, Class 1, galvanized steel duct coated with polyvinyl chloride plastic, 4 mil thick on outside and 2 mil thick on inside.
- E. Slab Duct Ventilation System: Machine made from round spiral lock seam duct with light reinforcing corrugations, galvanized steel outer wall, one inch (1") thick fiberglass insulation, perforated galvanized steel inner wall; fittings manufactured with solid inner wall.

2.04 CASINGS

- A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible and construct for operating pressures indicated.
- B. Mount floor mounted casings on four inch (4") high concrete curbs. At floor, rivet panels on eight inch (8") centers to angles. Provide liner of 18 gauge galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields where floors are acoustically insulated.
- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where required for access to equipment for cleaning and inspection. Provide clear wire glass observation ports, minimum 6" x 6" size.
- D. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gauge back facing and 22 gauge perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels three inch (3") thick packed with 4.5 lb./cu. ft. minimum fiberglass media on inverted channels of 16 gauge.

2.05 EXPOSED SPIRAL DUCTWORK

- Galvanized spiral duct construction and gauge shall be in accordance with SMACHNA HVAC Duct Construction Standards.
- B. Fittings: All fittings shall be self-sealing, double lipped, gasket type fittings with EPDM rubber gasket. No external sealant or tape is allowed. Fittings shall be galvanized steel constructed in accordance with ASTM A653 and A924.
- C. Elbows: Elbows shall be gored elbows. 4° elbows shall be 3-piece elbows and 90° elbows shall be 5-piece elbows.
- D. Hangers: Exposed spiral duct hangers shall be steel aircraft quality zinc coated wire hangers or 1/8" thick, 1" wide galvanized steel strap with threaded rod.
- E. Taps: System shall utilize high efficiency shoe type saddle taps.
- F. Reducers: All spiral reducers in exposed areas shall be concentric to keep centerline of duct at consistent elevation.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible.
- C. All ductwork shall be sealed to provide a SMACNA Seal Class A installation for all longitudinal seams, all transverse seams and all duct penetrations. Flame spread rating shall not exceed 25 and smoke developed shall not exceed 50 when tested in compliance with ASTM-E-84-87.
- D. Sealant shall be non-hardening and water resistant. Sealant shall be capable of being applied with a brush and shall be applied in accordance with manufacturer's instructions. Each seam or penetration shall be dressed after application of sealant for neat appearance.

- E. Ductwork shall be installed following essentially lines indicated on the drawings. Install offsets, and angles. Transitions may be required to avoid interference with other work and existing conditions. Maintain full capacity of ductwork.
- F. Flex Duct Installation:
 - 1. Maximum length of flex duct: 5ft
 - 2. Provide 90 deg elbow splines to prevent flex duct kinking, especially when connecting to ceiling diffusers
 - 3. Connections to rigid ducts and fittings: Peal back insulation and place flexible inner core over fitting and seal with two layers of duct tape (minimum 2" overlap on fitting and flex duct core). Install clamps over the top of the duct tape. Stretch insulation back over fitting and wrap with two layers of duct tape. Duct Sealant/Mastic may be substituted for the tape that seals the inner core to the fitting. Refer to manufacturer's instructions. Duct tape, mastic/sealant and clamps shall be UL181 listed.
- G. Duct sizes are net outside dimensions. Maintain outside sizes for lined ducts. Do not increase duct dimensions.
- H. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- I. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- J. Use crimp joints with or without bead for joining round duct sizes eight inch (8") and smaller with crimp in direction of airflow.
- K. Use double nuts and lock washers on threaded rod supports.
- L. Connect terminal units to supply ducts directly with rigid duct. Do not use flexible duct.
- M. Connect diffusers to low pressure ducts directly or with five foot (5') maximum length of flexible duct held in place with strap or clamp.
- N. Connect flexible ducts to metal ducts with draw bands.
- O. Set plenum doors six inch (6") to 12 inches above floor. Arrange door swing so that fan static pressure holds door in closed position.
- P. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- Q. All joints in rectangular rigid round or oval ductwork that exceeds 100 inches in perimeter length shall be made with the "Ductmate Industries" flanged and caulked joint system.
- R. For units with filtered return air grilles (fan coils, blower coils, heat pumps, etc.), remove the unit filter and connect the return air ductwork tight to the unit. The return duct shall match the size of the unit return air opening.

3.02 CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that may be harmed by excessive dirt with temporary filters or bypass during cleaning.
- B. Clean duct systems with high power vacuum machines. Protect equipment that may be harmed by excessive dirt with filters or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

3.03 SCHEDULES

DUCTWORK MATERIAL

AIR SYSTEM	MATERIAL
Low Pressure Supply	Galvanized Steel
Buried Supply or Return Steel Ste	eel, PVC Coated Steel, Concrete, Fiberglass
	Reinforced Plastic
Medium & High Pressure Supply	Galvanized Steel
Return and Relief	Galvanized Steel
General Exhaust	Galvanized Steel
Ductwork above and in the shower area	Aluminum
Kitchen Hood Exhaust	Steel, Stainless Steel
Dishwasher Exhaust	Stainless Steel, Aluminum, Fiberglass
	Reinforced Plastic
Fume Hood Exhaust St	ainless Steel, Fiberglass Reinforced Plastic
Outside Air Intake	Galvanized Steel
Combustion Air	Galvanized Steel
Evaporative Condenser Intake & Exhaust	Galvanized Steel
Emergency Generator Ventilation	Galvanized Steel
Exterior Ductwork Pro	e-insulated Weatherproof Exterior Ductwork

DUCTWORK PRESSURE CLASS

AIR SYSTEM	PRESSURE CLASS
Supply	2"
Buried Supply or Return	2"
Return and Relief	1"
General Exhaust	1"
Dishwasher Exhaust	1"
Kitchen Hood Exhaust	1"
Fume Hood Exhaust	2"
Intake and Exhaust	1"
Outside Air Intake	1/2"
Evaporative Condenser	1/2"
Emergency Generator	1/2"

A. Note:

- 1. Supply ductwork upstream of variable volume terminal units shall be at a pressure class of (2") two inches. Downstream of the air terminal units shall be at a pressure class of (1") one inch.
- 2. Supply ductwork upstream of dual duct, terminal unit shall be at a pressure class of four inches.

SECTION 233300 AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air turning devices/extractors
- B. Backdraft dampers
- C. Duct access doors
- D. Duct test holes
- E. Flexible duct connections
- F. Volume control dampers
- G. Rectangular control dampers
- H. Round control dampers
- Ductwork flow sensors

1.02 RELATED SECTIONS

- A. Specification Section 233100 HVAC Ducts and Casings.
- B. Specification Section 233600 Air Terminal Units.

1.03 REFERENCES

- A. NFPA 90A Installation of Air Conditioning and Ventilating Systems
- B. NFPA 92A Smoke Control Systems
- C. NFPA 70 National Electrical Code
- D. SMACNA HVAC Duct Construction Standards Metal and Flexible
- E. UL 33 Heat Responsive Links for Fire-Protection Service
- F. UL 555 Fire Dampers and Ceiling Dampers
- G. UL 555S Leakage Rated Dampers for use in Smoke Control Systems

1.04 SUBMITTALS

- A. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers and all accessories.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, and fire and smoke dampers. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate for combination fire and smoke dampers.

1.05 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors or test holes.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.07 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc., as suitable for the purpose specified and indicated.

1.08 DELIVERY, STORAGE AND HANDLING

- Deliver, store, protect and handle products to site under provisions of Architectural Specification Sections.
- B. Protect dampers from damage to operating linkages and blades.

1.09 EXTRA MATERIALS

A. Provide two of each size and type of fusible link for each style or type of fire damper or combination fire/smoke damper furnished for this project.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with radius blades attached to pivoting frame and bracket, steel construction with push-pull operator strap.

2.02 BACKDRAFT DAMPERS

- A. Manufacturers:
 - 1. Ruskin
 - 2. United Air
 - 3. Greenheck
 - 4. NCA
 - 5. United Enertech
 - 6. Engineer approved equal.
- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Extruded aluminum with blades of maximum six inch (6") width with flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, bearings and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.03 DUCT ACCESS DOORS

- A. Manufacturers:
 - 1. Ruskin
 - 2. Nailor
 - 3. Engineer approved equal.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, and as indicated.
- C. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. Install minimum one inch (1") thick insulation with sheet metal cover for insulated ductwork.
 - 1. Less Than 12 Inch Square: Secure with sash locks.
 - 2. Up to 18 inch Square: Provide two hinges and two sash locks.
 - 3. Up to 24 inch x 48 Inches: Three hinges and two compression latches with outside and inside handles.
 - 4. Larger Sizes: Provide an additional hinge.
- D. Access doors with sheet metal screw fasteners are not acceptable.

2.04 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches or neoprene plugs.
- B. Permanent Test Holes: Factory fabricated, airtight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, and as indicated.
- B. Connector: Fabric crimped into metal edging strip.
- C. Fabric: UL listed fire-retardant neoprene coated woven fiberglass fabric to NFPA 90A, minimum density 30 oz. per sq. yd.
- D. Net Fabric Width: Approximately two inches (2") wide.
- E. Metal: Galvanized 24 gauge steel, three inches (3") wide.

F. Leaded Vinyl Sheet: Minimum 0.55 inches thick, 0.87 lbs. per sq. ft., 10 dB attenuation in 10 to 10,000 Hz range.

2.06 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards Metal and Flexible, and as indicated.
- B. Splitter Dampers:
 - Material: Same gauge as duct to 24 inch size in either direction and two gauges heavier for sizes over 24 inches.
 - 2. Blade: Fabricate of double thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3. Operator: Minimum 1/4 inch diameter rod in self-aligning, universal joint action flanged bushing with set screw.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6" x 30 inches.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 inches x 72 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- E. End Bearings: Except in round ductwork 12 inch and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases or adapters.
 - 3. Where rod lengths exceed 30 inches, provide regulator at both ends.

2.07 RECTANGULAR CONTROL DAMPERS

- A. Test in accordance with AMCA 500. Damper must be a Class 1 or 1A low leakage damper.
- B. Frames must be aluminum or galvanized steel welded or riveted with corner reinforcement, minimum 16 gauge.
- C. Blades must be aluminum or galvanized steel airfoil shape with maximum blade size of 6" W x 48" L minimum 22 gauge, attached to minimum 1/2 inch shafts with setscrews.
- D. The maximum section size must not be larger than 48" W x 48" H. A larger damper must be constructed of multiple sections joined together by a jack shaft.
- E. All single section dampers must have an extended shaft.
- F. Blade seals must be synthetic elastomeric mechanically attached, field replaceable.
- G. Shaft bearings must be plastic or stainless steel.
- H. Jamb seals must be compressible and flexible metal.
- I. The leakage must be 4 CFM/SF or less at one inch (1") wg static pressure difference.
- J. The fully closed damper assembly must be capable of withstanding the shutoff pressure (total pressure of fan produced at no flow) of the air moving system's fan without damage.
- K. The damper must have an operating temperature range of -40 to 200 deg F.
- L. Operators:
 - 1. Provide smooth proportional control with sufficient power for air velocities 20% greater than maximum design velocity and provide tight seal against maximum system pressures. Provide spring return for two-position dampers and for modulating dampers requiring fail-safe operation.
 - 2. All modulating damper actuators must be electronic, using a 120V positioning input.
 - 3. Modulating outside, relief and exhaust air dampers, modulating return air dampers associated with an outside air damper and modulating face and bypass dampers associated with a heating coil must fail safe. The outside, relief and exhaust dampers

- must fail closed. The return dampers must fail open. The face and bypass dampers must fail to an open face and a closed bypass.
- 4. All two-position damper actuators must be electronic, using a 120v positioning input.
- 5. Provide a sufficient number of damper actuators, each of sufficient torque, to achieve smooth movement throughout the damper assembly range. As a minimum, provide one damper operator for every 16 sq. ft. of damper area.

2.08 ROUND CONTROL DAMPERS

- Test in accordance with AMCA 500.
- B. Damper must be butterfly type with circular blade attached to a shaft.
- C. Frames must be aluminum or galvanized steel, minimum 20 gauge.
- D. Blades must be aluminum or galvanized steel, minimum 22 gauge, attached to 1/2 inch shaft.
- E. The damper must have an extended shaft.
- F. Blade seals must be synthetic elastomeric mechanically attached.
- G. Shaft bearings must be plastic or stainless steel.
- H. The leakage must be 0.1 CFM/perimeter inch or less at one inch (1") wg static pressure difference.
- I. The fully closed damper assembly must be capable of withstanding the shutoff pressure (total pressure of fan produced at no flow) of the air moving system's fan without damage.
- J. The damper must have an operating temperature range of -40 to 200 deg F.
- K. Operators:
 - 1. Provide smooth proportional control with sufficient power for air velocities 20% greater than maximum design velocity and provide tight seal against maximum system pressures. Provide spring return for two-position dampers and for modulating dampers requiring fail-safe operation.
 - 2. All modulating damper actuators must be electronic, using a 0-10 Vdc or 4-20 mA positioning input.
 - 3. Modulating outside, relief and exhaust air dampers, modulating return air dampers associated with an outside air damper and modulating face and bypass dampers associated with a heating coil must fail safe. The outside, relief and exhaust dampers must fail closed. The return dampers must fail open. The face and bypass dampers must fail to an open face and a closed bypass.
 - 4. All two-position damper actuators must be electronic, using a 120v positioning input.
 - 5. Provide a sufficient number of damper actuators, each of sufficient torque, to achieve smooth movement throughout the damper assembly range.

2.09 DUCTWORK FLOW SENSORS (FS)

- A. Manufacturers:
 - 1. Titus #EXX
 - 2. Redi-Flow
 - 3. Metal Aire
 - 4. Ruskin
 - 5. Krueger
 - 6. Price
 - 7. Engineer approved equal.
- B. Furnish airflow sensors where indicated.
- C. Sensors shall be pre-installed in a section of round ductwork with total pressure and static pressure pneumatic ports mounted on exterior.
- D. Sensor shall be multi-port, cross or ring pattern.
- E. Combination volume and ductwork flow sensors equal to Ruskin #VFBD35 are acceptable as equal. Provide with submittal.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards Metal and Flexible.
- B. Provide backdraft dampers on exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers at fire dampers, combination fire and smoke dampers and elsewhere as indicated. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers, combination fire and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, and breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
- G. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment and supported by vibration isolators. Use braided stainless steel flexible connections to equipment located within a one hour rated area.
- H. Provide volume balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off. Drawings may not indicate all volume damper locations.
- I. Use splitter dampers only where indicated.
- J. Provide volume balancing dampers on duct take-off to diffusers, grilles and registers, regardless of whether dampers are specified as part of the diffuser, grille or register assembly. Locate as close as possible yet accessible to the main trunk duct. Drawings may not indicate all volume damper locations.
- K. The electrical contractor shall wire smoke damper operators.
- L. Provide turning vanes in all supply, return and exhaust ductwork unless noted otherwise. Turning vanes shall not be installed in kitchen hood exhaust, dishwasher hood exhaust and kiln hood exhaust.
- M. Install ductwork flow sensor in such a way that it is easily accessible for balancing of system. Provide manual volume damper downstream of flow sensors.

SECTION 233423 HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall exhausters
- B. Cabinet and ceiling exhaust fans
- C. Dryer vent booster fan

1.02 RELATED SECTIONS

- A. Specification Section 233100 HVAC Ducts and Casings
- B. Specification Section 233300 Air Duct Accessories

1.03 REFERENCES

- A. AMCA 99 Standards Handbook
- B. AMCA 210 Laboratory Methods of Testing Fans for Rating Purposes
- C. AMCA 261 Directory of Products Licensed to Bear the AMCA Certified Ratings Seal
- D. AMCA 300 Test Code for Sound Rating Air Moving Devices
- E. AMCA 301 Method of Publishing Sound Ratings for Air Moving Devices
- F. NEMA MG1 Motors and Generators
- G. NFPA 96 Installation of Equipment for the Removal of Smoke and Grease Vapors from Commercial Cooking Equipment
- H. UL 705 Power Ventilators

1.04 SUBMITTALS

- A. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- B. Manufacturer's Instructions: Indicate installation instructions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

- A. Kitchen Range Hood Exhaust Fans: Comply with requirements of NFPA 96.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 WALL EXHAUSTERS

- A. Manufacturers:
 - 1. Greenheck
 - 2. Cook
 - 3. Carnes
 - 4. Penn Ventilator
 - 5. Engineer approved equal.
- B. Performance: See drawings.
- C. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor, 1/2 inch mesh, 16 gauge aluminum wire bird screen.

- D. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted solid state speed controller where indicated.
- E. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- F. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked. Where indicated on the drawings and schedules provide a powered back draft damper with line voltage motor drive, power open, and spring return. Verify voltage.
- G. Sheaves: Provide cast iron (for V-belt drives) dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.02 CABINET AND CEILING EXHAUST FANS

- A. Manufacturers:
 - 1. Greenheck
 - 2. Cook
 - 3. Carnes
 - 4. Penn Ventilator
 - 5. Twin City Fan
 - 6. Acme
 - 7. Loren Cook
 - 8. Engineer approved equal.
- B. Performance: See drawings.
- C. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
- D. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes and materials indicated.
- E. Disconnect Switch: Cord and plug in housing for thermal overload protected motor.
- F. Grille: Molded white plastic or aluminum with baked white enamel finish.
- G. Sheaves: Steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.03 DRYER VENT BOOSTER FAN

- A. Manufacturers: (Install per manufacturers directions).
 - 1. Tjernlund #LB1 (Phone # 800-255-4208) (note to spec writer: This is the only no-clog fan.)
 - 2. Fantech #DBF4XL
 - 3. Continental #AXC-100B
 - 4. Engineer approved equal.
- B. Provide inline dryer exhaust booster fan with positive pressure sensor fan proving switch.
- C. Fan Kit Shall Include:
 - 1. One inline fan.
 - 2. One pressure switch with integral delay.
 - 3. One universal fan mounting bracket and hardware.
- D. Fan shall be mounted a minimum of 15 linear (not equivalent) feet of duct from the dryer outlet. Mount fan as close as possible to the termination of the ductwork.
- E. Provide independent electrical circuit and plug in receptacle.

PART 3 EXECUTION

3.01 INSTALLATION

- Install in accordance with manufacturer's instructions.
- B. Secure roof or wall exhausters with cadmium plated steel lag screws to roof curb or structure.
- C. Extend ducts to roof or wall exhausters into roof curb or structure. Counterflash duct to roof or wall or opening.
- D. Hung Cabinet Fans:
 - Install fans with resilient mountings and flexible electrical leads.
 - 2. Install flexible connections between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
- E. Provide sheaves required for final air balance.
- F. Install backdraft dampers on inlet to roof and wall exhausters.
- G. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans.
- H. Do not operate fans until ductwork is clean, filters are in place, and bearings are lubricated.
- I. Support ceiling fans from structure.
- J. Insulate dryer vent booster fan per manufacturers recommendations.
- K. Provide kitchen hood up blast exhaust fans with grease trap and vented curb. Exhaust fan housing shall be hinged and the motor and belt drive shall be located out of the air stream.
- L. If equipment is to be operated prior to building turn over to the owner, the mechanical contractor must install filter media on all return and exhaust grilles. The contractor shall provide documentation that filters have been check on a daily basis.

3.02 EXAMINATION

A. Examine areas to receive fans. Notify the Design Team Engineer of conditions that would adversely affect installation or subsequent utilization and maintenance of fans.

3.03 SCHEDULES

A. See drawings.

SECTION 233700 AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers/registers/grilles
- B. Louvers

1.02 REFERENCES

- A. ADC 1062 Certification, Rating and Test Manual
- B. AMCA 500 Test Method for Louvers, Dampers and Shutters
- C. ARI 650 Air Outlets and Inlets
- D. ASHRAE 70 Method of Testing for Rating the Air Flow Performance of Outlets and Inlets
- E. SMACNA HVAC Duct Construction Standard Metal and Flexible
- F. NFPA 70 National Electrical Code
- G. NFPA 90A Installation of Air Conditioning and Ventilating Systems

1.03 SUBMITTALS

A. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Review ceiling type and style before submitting. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.04 PROJECT RECORD DOCUMENTS

Record actual locations of air outlets and inlets.

1.05 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Test and rate louver performance in accordance with AMCA 500.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

PART 2 PRODUCTS

2.01 DIFFUSERS/REGISTERS/GRILLES

- A. Manufacturers:
 - 1. Titus
 - 2. Carnes
 - 3. Tuttle & Bailey
 - 4. Price Ind.
 - 5. Krueger
 - 6. Nailor
 - 7. Engineer approved equal.
- B. Refer to schedule on drawings for style, size, and finish.

2.02 LOUVERS

- A. Manufacturers:
 - 1. Ruskin
 - 2. American Warming
 - 3. Louvers and Dampers, Inc.
 - 4. Pottorff
 - 5. Greenheck

- 6. United Enertech
- 7. Engineer approved equal.
- B. Type: Drainable blades on 37-1/2 degree slope, heavy channel frame bird screen with 1/2 inch square mesh for exhaust and 3/4 inch for intake. (See drawings).
- C. Fabrication: Extruded aluminum, 0.080 inch thick welded assembly with factory anodized finish. Color to be selected by architect. Architect has authority to select multiple colors.
- D. Mounting: Furnish with exterior flat flange for installation. Verify with architect prior to ordering.
- E. Interior louvers shall be constructed of .125 inch thickness with welded construction.
- F. Refer to drawings for louver dimensions.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position and type to conform to architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with airtight connection.
- D. Provide balancing dampers on duct take-off to diffusers, grilles and registers, despite whether dampers are specified as part of the diffuser or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.

3.02 SCHEDULES

A. See drawings.

SECTION 235400 FURNACES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Furnaces
- B. Evaporator coil units
- C. Condensing units
- D. Thermostats

1.02 RELATED SECTIONS

- A. Specification Section 230553 Identification for HVAC Piping and Equipment
- B. Specification Section 230713 Duct Insulation
- C. Specification Section 231123 Natural Gas and Propane Piping
- D. Specification Section 232300 Refrigerant Piping and Specialties

1.03 REFERENCES

- A. ANSI/AHRI 210/240 Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment
- B. ANSI/AHRI 270 Sound Rating of Outdoor Unitary Equipment
- C. ANSI/AHRI 520 Performance Rating of Positive Displacement Condensing Units
- D. ANSI/AHRI 610 Performance Rating of Central System Humidifiers for Residential Applications
- E. ASHRAE 23 Methods of Testing for Rating the Performance of Positive Displacement Refrigerant Compressors and Condensing Units That Operate at Subcritical Temperatures
- F. ASHRAE 15 Safety Code for Mechanical Refrigeration
- G. ASHRAE 52 Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter
- H. ASHRAE 90 Energy Conservation in New Building Design
- I. ASHRAE 103 Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers
- J. NFPA 31 Installation of Oil Burning Equipment
- K. NFPA 54 (AGA Z223.1) National Fuel Gas Code
- L. NFPA 90A Installation of Air Conditioning and Ventilating Systems
- M. NFPA 90B Installation of Warm Air Heating and Air Conditioning Systems
- N. NFPA 211 Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances
- O. UL 207 Refrigerant-Containing Components and Accessories, Non-Electrical
- P. UL 727 Oil-Fired Central Furnaces
- Q. UL 729 Oil-Fired Floor Furnaces

1.04 SUBMITTALS

- A. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data and wiring diagrams and unit supports.
- B. Shop Drawings: Indicate assembly, required clearances, location and size of field connections.
- C. Design Data: Indicate refrigerant pipe sizing and routing.
- D. Manufacturer's Instructions: Indicate rigging, assembly and installation instructions.
- E. Project Record Documents: Record actual locations of components and connections.

- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating installation instructions, maintenance and repair data, and parts listing.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in owner's name and registered with manufacturer.

1.05 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.06 WARRANTY

- A. Comprehensive parts and labor warranty for furnace, condensing unit and thermostat for 12 months after start of beneficial use by owner or 18 months after date of shipment from factory, whichever is sooner.
- B. Parts warranty for compressor from end of comprehensive warranty until four years later.
- C. Parts warranty for heat exchanger from end of comprehensive warranty until nine years later.
- D. Warranties must not be pro-rated.

PART 2 PRODUCTS

2.01 FURNACES (GAS FIRED)

- A. Manufacturer:
 - 1. Lennox
 - 2. Carrier
 - 3. Trane
 - 4. Heil
 - 5. York
 - 6. Engineer approved equal.
- B. Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, natural gas heating section, controls and accessories; wired for single power connection with control transformer.
- C. Airflow Configuration: See schedule on drawings.
- D. Heating: Two stage natural gas fired.
- E. Electric Refrigeration: Refrigerant cooling coil and outdoor package containing compressor, condenser coil and condenser fan.
- F. Accessories: See schedule on drawings.
- G. Provide with factory external filter cabinet with one inch (1") thick MERV 13 filter.
- H. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, fiberglass insulation with reflective liner.
- I. Supply Fan: Centrifugal type rubber mounted.
- J. Motor: Multiple speed, permanently lubricated.
- K. Heat Exchanger: Aluminized steel welded construction with aluminum finned stainless steel tube condensing coil.
- L. Gas Burner:
 - 1. Sealed combustion with blower.
 - 2. Gas valve provides 100% safety gas shut-off; 24 volt combining pressure regulation, safety pilot, pilot filtration, and automatic electric valve.
 - 3. Electronic pilot ignition with electric spark igniter.
 - 4. Non-corrosive combustion air blower with permanently lubricated motor.
- M. Gas Burner Safety Controls:
 - 1. Thermocouple Sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.

- 2. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.
- N. Operating Controls:
 - 1. Room Thermostat: Cycles burner to maintain room temperature setting.
 - 2. Supply Fan Control: Energize from bonnet temperature independent of burner controls with adjustable timed off delay and fixed timed on delay with manual switch for continuous fan operation.
- O. Performance:
 - Ratings: Energy Efficiency Rating (EER) not less than requirements of ASHRAE 90A; seasonal efficiency to ASHRAE 103.
 - 2. Refer to Furnace Schedule. Gas heating capacities are sea level ratings.

2.02 EVAPORATOR COIL UNITS

- A. Manufacturers:
 - Match furnace manufacturer.
- B. Construction and Ratings: In accordance with ANSI/ARI 210/240 and UL 207.
- C. Evaporator Coil: Copper tube aluminum fin assembly, galvanized drain pan, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve, steel cabinet with baked enamel finish and insulation.
- D. Cooling Capacity: See schedule on drawings.

2.03 CONDENSING UNITS

- A. Manufacturer:
 - 1. Match furnace manufacturer.
- B. Construction and Ratings: In accordance with ANSI/AHRI 210/240, and UL 207. Testing: ASHRAE 14.
- C. Compressor: ANSI/AHRI 520; Scroll; hermetic, resiliently mounted integral with condenser with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling.
- D. Refrigeration Accessories: Filter drier, high pressure switch, low pressure switch, service valves and gauge ports, and thermometer well. Provide refrigerant lines, factory cleaned, dried, pressurized and sealed with insulated suction line.
- E. Air Cooled Condenser: ANSI/AHRI 520; aluminum fin and copper tube coil with direct drive axial propeller fan resiliently mounted, and galvanized fan guard. See capacity schedule on the drawings.
- F. Electrical Characteristics: See schedule on the drawings.
- G. Disconnect Switch: Field mounted disconnect by electrical contractor.
- H. Refrigeration Operating Controls:
 - Room Thermostat: Cycles condensing unit and supply fan to maintain room temperature setting.
 - 2. Low Ambient Kit: Provide low ambient controls to allow compressor to start and run at 30°F.

2.04 THERMOSTATS

- A. Manufacturer:
 - 1. Honeywell Vision Pro 8000
 - 2. Lennox Comfortsense
 - 3. White-Rodgers
 - 4. Engineer approved equal.
- B. Electric Solid State Micro-Computer Based Room Thermostat:
 - 1. Minimum of two stages of gas heat and two stages of cooling.
 - 2. Touch screen.

- 3. Preferential rate control to minimize overshoot and deviation from setpoint.
- 4. Set-up for four separate temperatures per day.
- 5. Instant override of setpoint for continuous or timed period from one hour to 31 days.
- 6. Short cycle protection.
- 7. Programming based on every day of the week.
- 8. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, and fan on-auto.
- 9. Battery replacement without program loss.
- 10. Heat pump compressor lockout.
- 11. Keypad lockout.
- 12. Early startup capabilities to reach setpoint at desired time of day.
- 13. Thermostat Display:
 - a. Time of day.
 - b. Actual room temperature.
 - c. Programmed temperature.
 - d. Programmed time.
 - e. Duration of timed over ride.
 - f. Day of week.
 - g. System Mode Indication: Heating, cooling, auto, off, fan auto, fan on.
 - 1) If schedule is in occupied, cycle the fan with heating or cooling demand.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that the floors are ready for installation of units and openings are as indicated on the shop drawings.
- B. Verify proper power supply is available for furnace and condenser package.
- C. Verify proper fuel supply is available for connection.
- D. Verify water supply is available for humidifier.

3.02 INSTALLATION

- A. Install in accordance with NFPA 90A and NFPA 90B.
- B. Install gas fired furnaces in accordance with ANSI Z223.1 NFPA 54.
- C. Provide vent connections in accordance with NFPA 211.
- D. Install refrigeration systems in accordance with ASHRAE 15.
- E. Mount furnaces on 4" concrete pad with neoprene vibration isolators.
- F. Mount air-cooled condensing unit on four-inch concrete pad on grade or on rooftop supports. See drawings for location.
- G. This contractor is responsible for all control wiring.
- H. Provide a one-hour enclosure around PVC intake and vent piping located in a ceiling return air plenum.
- Insulate vent and intake piping in attic space in accordance to manufacturer's recommendations.
- Provide a lockable, clear enclosure to surround the thermostat.
- K. All thermostats shall be installed per all applicable ADA Codes and Guidelines.
- L. Pipe drain from cooling coils and humidifiers to nearest floor drain. Install per manufacturer's instructions.
- M. Refrigerant piping shall be sized and installed per manufacturer requirements. Provide necessary accessories for long-line application as required.

SECTION 238101

TERMINAL HEAT TRANSFER, CONVECTION HEATING, AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electric wall heaters
- B. Electric unit heaters

1.02 RELATED SECTIONS

A. Specification Section 232300 - Refrigerant Piping

1.03 REFERENCES

- A. NFPA 70 National Electrical Code
- B. UL 303 Refrigeration and Air-Conditioning Condensing and Compressor Units

1.04 SUBMITTALS

- A. Product Data: Provide typical catalog of information including arrangements.
- B. Shop Drawings:
 - 1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
 - 2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers and comparison of specified heat required to actual heat output provided.
 - 3. Indicate mechanical and electrical service locations and requirements.
- C. Manufacturer's Instructions: Indicate installation instructions and recommendations.
- D. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valve.
- E. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been completed in owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three-years experience.

1.06 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.07 WARRANTY

A. Provide one-year manufacturer's warranty for condensing units and compressors.

PART 2 PRODUCTS

2.01 ELECTRIC WALL HEATERS

- A. Manufacturers:
 - 1. Berko
 - 2. Heatrex
 - 3. Indeeco WAI
 - 4. Markel
 - 5. Raywall
 - 6. Engineer approved equal.
- B. Coils: Industrial grade steel finned tubular elements.

- C. Cabinet: 18 gauge steel housing (4-1/2" deep) with Extruded aluminum heavy duty architectural grille. Provide surface, recessed, or semi-recessed mount kit. Confirm mounting type with the design team.
- D. Finish: Polyester powder paint finish. Architect shall select color from standard color chart.
- E. Fans: Propeller fan, statically and dynamically balanced, direct driven, permanently lubricated bearings.
- F. Motor: Permanently lubricated, totally enclosed motor.
- G. Control: Integral thermostat with Fan On/Auto switch.
- H. Electrical: Integral disconnect switch.
- I. Submit color chart for architectural approval.

2.02 ELECTRIC UNIT HEATERS

- A. Manufacturers:
 - Berko
 - 2. Heatrex
 - 3. Indeeco
 - 4. Markel
 - 5. QMark
 - 6. Raywall
 - 7. Engineer approved equal.
- B. Heating Elements: Industrial grade stainless steel tubular elements in 2-10 KW units and steel finned tubular elements in 15-60 KW units.
- Cabinet: 18 gauge galvanized steel with polyester powder coat finish. Color as selected by the architect.
- D. Outlet Grille: Adjustable louvers with protective mesh screen.
- E. Fan: Direct drive propeller type statically and dynamically balanced with permanently lubricated bearings.
- F. Motor: Blow through, totally enclosed, thermally protected motor.
- G. Mounting: Factory assembled wall or ceiling hanger.
- H. Control: Integral thermostat.
- I. Electrical: Manufacturer's integral disconnect switch.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.
- C. Protection: Provide finished cabinet units with protective covers during balance of construction.
- D. Unit Heaters: Hang from building structure with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
- E. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units
- F. Hydronic Units: Provide with shut off valve on supply and lock shield-balancing valve on return piping, unless otherwise shown on piping details. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. Provide manual air vents for all hydronic coils.
- G. Units with Cooling Coils: Provide drain pan with indirect connection to condensate drain.

- H. Install electric heating equipment, including devices furnished by the manufacturer, but not factory mounted. Furnish copy of manufacturer's wiring diagram submittal. Install electrical wiring in accordance with manufacturer's submittals.
- I. Install refrigeration systems in accordance with ASHRAE 15.
- J. Mount air-cooled condensing unit on rooftop supports. See drawings on location.

3.02 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of all units. Vacuum clean the coils and inside of the cabinets.
- B. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.
- C. Install new filters.

3.03 SCHEDULES

A. See drawings.

SECTION 260050

BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Electrical Requirements specifically applicable to Electrical Division Specification Sections.
- B. Division 26 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

1.02 WORK BY OWNER

- A. Owner's Responsibility:
 - Arrange for and deliver owner reviewed shop drawings, product data and samples to contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective or deficient items.
- B. Contractor's Responsibility:
 - 1. Review owner reviewed shop drawings, product data and samples.
 - 2. Review and unload owner purchased materials at site, inspect for completeness and/or damage jointly with the owner.
 - 3. Handle, store, install and finish products. Install electrical wiring and devices.
 - 4. Repair and/or replace items damaged after receipt.
- C. Contractor shall be aware Owner may purchase equipment where Contractor has specific responsibilities.

1.03 OWNER OCCUPANCY

- A. The owner will occupy the premises during the construction period.
- B. Limit use of site and premises to allow owner occupancy.
- C. Cooperate with the owner to minimize conflict and to facilitate owner's operations.
- D. Schedule the work to accommodate this requirement.

1.04 REGULATORY REQUIREMENTS

- A. This contractor shall give proper authorities all requisite notices relating to work in his charge, obtain official permits, licenses for temporary construction and pay proper fees for it.
- B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by himself, by his employees or through any operation under his charge, whether in the contract or extra work.
- C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.
- D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.
- E. All work shall comply with the applicable recommendations of:
 - The National Board of Fire Underwriters
 - The ANSI-NFPA 70 National Electrical Code
 - 3. The National Fire Protection Association (NFPA)
 - 4. The Occupations Safety and Health Act (OSHA)

- 5. IBC Building Code (current) and any current applicable city building and or electrical codes.
- 6. Fire Protection: Conform to International Fire Code (IFC) and NFPA.
- 7. International Energy Conservation Code (IECC)
- F. Obtain permits and request inspections from authority having jurisdiction.
- G. Conform to latest approved versions of codes.

1.05 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on drawings unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.
- C. This contractor, before submitting his bid, shall visit the site of the project to familiarize himself with locations and conditions affecting his work.
- D. It is the intent of this specification that the contractor furnish all labor and material required to complete the installation as outlined in the drawings and specifications. No additions to the contract price will be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.
- E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing wiring conduits, electrical panels, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.
- F. This contractor shall provide, as necessary, for the installation of his work and in accordance with materials other than the structure.

1.06 SEQUENCING AND SCHEDULING

- A. This contractor shall arrange his work in order that it progresses along with the general construction of the building.
- B. This contractor shall be kept informed as to the work of other trades engaged in the project and shall execute his work in such a manner so as not to delay or interfere with progress of other contractors.
- C. Where space for mechanical and electrical lines and piping is limited, it is imperative that all such trades coordinate their work so as to insure concealment in space provided. Where conflict exists, the engineer shall decide priority of space. If work is not properly coordinated, the engineer may require removal and relocation of work without additional compensation.

1.07 GUARANTEE

- A. This contractor shall guarantee all of the apparatus, materials, equipment furnished, and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.
- B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.
- C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at his own expense.

1.08 ENGINEER APPROVED EQUAL PRODUCTS

A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.

- B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.
- C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".
- D. Similar products shall be all of the same manufacturers and style. There is no exception to this unless prior approval has been granted from engineer.

1.09 OWNER'S RIGHT OF SALVAGE

- A. Before beginning construction, the contractor shall check and verify with the owner each item of existing equipment that must be removed.
- B. The owner will designate which items of material or equipment not reused that he may wish to keep. The contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.
- C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for his use shall become the property of the contractor and shall be removed from the site.

1.10 PROTECTION AND MAINTENANCE

- A. The work covered by these drawings and specifications may involve work in both new and remodeled areas of the building.
- B. Where necessary to connect to any existing utility service, this electrical contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.
- C. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.
- D. This contractor shall protect existing equipment in finished areas from dirt, dust and damage as a result of his work.
- E. Coordinate protection requirements with department heads before beginning construction.
- F. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.11 DEMOLITION

- A. This contractor shall be responsible for the demolition and removal of all existing electrical elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be reused".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
 - 4. All elements to be removed are subject to the Owner's Right of Salvage.
- B. Preserve services to the existing facility. Extend/reroute/reconnect the existing systems as required providing for the continued function of these systems.

1.12 CUTTING AND PATCHING

- A. This contractor shall do all cutting and patching necessary for the installation of his work in all existing and new buildings unless otherwise noted.
- B. In areas where the integrity of new or existing fire separation assembly/wall is compromised by the work, this contractor shall be responsible to patch and/or seal openings as necessary to maintain and/or return fire separation to rating as required by applicable codes.

C. This contractor shall do all cutting and patching required for his work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.13 CLEANING AND RUBBISH

- A. This contractor, upon completion of his work, shall remove all rubbish and debris resulting from his operation and shall remove it from site at his own expense.
- B. As far as his work is concerned, all equipment shall be cleaned and the premises left in first class condition.
- C. This contractor shall maintain the work area each day to prevent hazardous accumulation of waste from his work.

1.14 SEALING AND PENETRATION

- A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.
- B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.
- C. Manufacturer offering products to comply with the requirements include the following:
 - Dow Corning "Silicone RTV Foam"
 - 2. 3-M Corporation "Fire Barrier Caulk and Putty"
 - 3. Thomas & Betts "Flame Safe Fire Stop System"
- D. Installation of these products are to be in strict accordance with the manufacturer's recommendations.
- E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.15 ELECTRICAL CONNECTIONS

- A. This contractor shall mount and wire all magnetic starters, thermal protective switches, and speed changing switches furnished under the mechanical contract and install such starters and switches and wire them to their respective motors as a part of the electrical contract.
- B. All other magnetic starter switches, safety switches and speed control devices indicated on the electrical drawings or specifications are the responsibility of the electrical contractor to furnish and install.
- C. Unless specifically stated elsewhere, the wiring of the temperature control system shall be the responsibility of the mechanical contractor.

1.16 HAZARDOUS MATERIALS

- A. If the contractor stores any hazardous solvents or other materials on the site, he shall obtain copies of the safety data sheets for the materials and post them at the site. He shall inform the owner and all employed of any potential exposure to this material.
- B. At no time shall any product containing asbestos be incorporated into the work.
 - 1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.17 AS-BUILT DRAWINGS

- A. This electrical contractor shall provide (at the conclusion of the project) one clean, non-torn, neat and legible "as-built" set of drawings to the owner. These drawings shall show the routing of conduit, wiring and equipment drawn in at scaled locations. All circuits shall be labeled and shall conform to labeled panel breakers. All dimensions indicated shall be referenced to a column line. A set of construction drawings will be furnished for this work.
- B. All electrical panels and electrical installed equipment shall be shown on the "as-built" drawings.
- C. Refer to General Specification Sections for additional requirements.

D. This contractor shall update these drawings during the project at least once a week.

1.18 REVIEW OF MATERIALS

- A. This contractor shall submit to the engineer for review one (1) electronic copy giving a complete list of materials, fixtures, devices and panels he proposes to furnish. The brochure shall contain complete information as to the make of equipment, type, size, capacities, dimensions, and illustration. One of the returned copies shall be kept on the job at all times.
- B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless he notifies engineer, in writing, of such deviation at time such drawings are furnished.
- C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.
- D. This contractor shall mark the date and sign each set. This indicates that each of them have been checked in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted or checked and will be marked "resubmit" and sent back to the contractor.

1.19 TEST OF SYSTEMS

- A. This contractor shall, before concealed, test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.
- B. This contractor shall be held responsible for all damage resulting from defects in the system.
- C. Each individual feeder circuit shall be tested at the panel and in testing for insulation resistance to ground; the power equipment shall be connected for proper operation. In no case shall the insulation resistance to ground be less than that required by the National Electrical Code (NEC).

1.20 SCOPE OF WORK

- A. This contractor shall furnish all the labor and material necessary to install a complete electrical system for the building. The system shall include all items of work as outlined in these specifications and on the drawings.
- B. All work shall be performed by a well-qualified, licensed electrician with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that his employees are familiar with all the various codes and tests applicable to this work.
- C. All equipment shall be new and of the type specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.
- D. The intent of the specifications and drawings is for complete installation of the systems outlined in the specifications and drawings so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation. The specifications and drawings cannot deal individually with the many minute items that may be eventually required by the nature of the systems.
- E. This contractor is required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type.
- F. This contractor, before proceeding with any work, shall review the architectural drawings. Any conflict between the electrical and architectural drawings shall be reported to the engineer for clarification.
- G. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer's attention and an addendum is issued for clarification.

- H. The Electrical Contractor shall establish electrical utility elevations prior to fabrication and installation. The Electrical Contractor shall coordinate utility elevations with other trades. All elevations shall be coordinated with all trades in the field prior to installation. When a conflict between trades arises, the design team shall be notified immediately prior to further installation however priority shall be as follows:
 - 1. Lighting Fixtures
 - 2. Gravity flow piping, including steam and condensate
 - 3. Sheet metal
 - 4. Other piping
 - 5. Conduits and wireway

1.21 DAILY HOUSEKEEPING AND CLEANING

- A. At the end of each workday, the contractor shall remove all of his debris, rubbish, tools, and surplus materials from the project work area. The work area shall be broom cleaned and left in a neat and orderly condition. The contractor shall not use the owner's waste disposal facility for the removal of debris from the project.
- B. At end of construction, all equipment shall be cleaned and the premises left in first class condition as far as this contractor's work is concerned.

1.22 ELECTRICAL UTILITY COMPANY

- A. Any fees by the utility company are to be billed directly to the owner.
- B. The contractor is required to assist the owner in the preparation of all utility company rebate forms that deal with equipment furnished and/or installed as a part of this contractor.

1.23 TELECOMMUNICATIONS UTILITY COMPANY

- A. Any fees by the telecommunications utility company are to be billed directly to the owner.
- B. The contractor shall be required to provide pathways to the property easement and/or right-of-way. Final Coordination of conduit routing and termination shall be performed by this contractor while communicating with each telecommunications utility company. This shall include telephone, cable television and internet services to the building.

1.24 WALL CONTINUITY (1 HR.)

- A. All items mounted in 1 hr. rated walls requiring an opening larger than a four inch (4") square (16 sq. inches) require the 1 hr. rating not be degraded.
- B. Any branch panel in a 1 hr. wall will require the exterior of the recessed panel be covered with 5/8 inch fire rated gypsum board. This is true for any device requiring more than a 16 sq. inch opening.

1.25 TRENCHING AND BACKFILLING

- A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.
- B. All underground utilities, telephone conduit, parking lot lighting, tunnels, etc shall be exactly located prior to digging. This contractor shall be held responsible for all damages caused by failure to do so.
- C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.
- D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.
- E. Refer to architectural specification sections for additional information.

1.26 LOW VOLTAGE CONDUIT INSTALLATION

A. This contractor shall install conduit serving low voltage cables located in all mechanical rooms and non-accessible areas and exposed structural areas. Use cable trays in other areas as indicated on the drawings. Where cable trays are not accessible, use J-hooks equal to Caddy Cable CAT. Provide hooks with closure holes and cable ties. Mount hooks three foot (3') on center.

- B. This contractor shall install conduit sleeves serving low voltage cables through walls and floors.
- C. Refer to other specification sections for additional information.

1.27 TEMPORARY POWER AND LIGHTING

A. Temporary electrical power and lighting necessary for the construction process is the responsibility of the electrical contractor and shall be included in the base bid amount.

1.28 GAS METER

- A. This contractor shall provide a 1/2 inch conduit from the interior of the power plant to the gas meter location. This conduit shall be used for telemeter of the natural gas consumption. This conduit shall be galvanized rigid steel and be terminated with bushings. The conduit shall be bonded to the building steel or the grounding system of the electrical system.
- B. Install a telephone pair from the meter to the telephone IDF. Provide a conduit and wire 110-volt circuit to gas meter, reuse existing power source. Verify location of gas meter.

1.29 EXTRA MATERIALS AND LABOR

A. The electrical contractor shall include in their bid additional resources for the removal and installation of 10 existing junction boxes in order to maintain access upon completion of construction. Provide new wiring as necessary where length is insufficient to maintain a complete system. The relocation requests may occur anytime during the construction process as requested by the Owner or Design Team. Junction boxes may be associated with Divisions 26, 27 and 28.

1.30 DIGITAL MEDIA AGREEMENT

- A. Computer Aided Drafting (CAD) documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.
- B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

1.31 SYSTEM CONFIGURATION AND PROGRAMMING FILES

- A. Supply system configuration and programming files where export is available.
- B. Supply uncompiled programming for systems applicable.
- C. All configuration and programming shall be property of the owner at conclusion of the project.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

SECTION 260051 PRE-BID SUBSTITUTION REQUEST FORM

This document shall be submitted for all MODUS projects where a manufacturer's sales rep requests that additional products be considered where they are not currently listed on the lighting fixture schedule and/or specifications. Where "Engineer Approved Equal" is listed on the fixture schedule, the designer for the project was unable to find a product that matched the performance and/ or aesthetic criteria required. Product submittals shall include notations on any variances so that they are brought to the attention of the designer for consideration.

All substitution requests shall be submitted to the electrical engineer (10) ten business days prior to the project bid date. The electrical engineer contact information can be found on the first page of the MEP cover sheet. If information is not available, please contact MODUS directly at (515) 251-7280 to identify the responsible party.

Refer to the paragraphs below for product submittal requirements. However, only page 2 is to be completed and submitted with the required information.

LIGHTING FIXTURE SUBSTITUTION REQUEST FOR CONSIDERATION:

- 1. Provide a summary, description, and any discrepancies of the lighting fixture(s) being submitted for consideration. i.e. "submitting alternate fixtures for cove products", "submitting alternate LED troffer", etc.
- 2. Summarize any differences that you are aware of for each product: "has 3.5" aperture while 3" was specified", "fixture has slightly lower lumen package but better efficacy", "steel pole instead of aluminum", etc.
- 3. Provide a list of lighting fixtures being submitted on your company letterhead along with this form at the beginning of the submittal. The list shall include the TYPE, MANUFACTURER and MODEL NUMBER that is being submitted.
- 4. Submitter shall include a product page for each type(s) being submitted. The product page shall have all parts of the model number identified by highlighting or boxing in the specific components. If these items are not identified, we will not review the submittal request.
- 5. Submit IES files for all products submitted, re-named with the fixture type being submitted. Photopia or other software created files will not be accepted. ie: TYPE FA.ies

LIGHTING CONTROLS SUBSTITUTION REQUEST FOR CONSIDERATION:

- 1. Provide a summary, description, and any discrepancies of the lighting control devices being submitted for consideration. ie "submitting alternate control devices".
- 2. Please provide and review the sequence of operation located on our lighting drawings that outline the required control methods for each space. It is our expectation that the submitter completely understands the manufacturer's responsibility to make sure all parts and pieces are included is your submittal.
- 3. Provide manufacturer warranty and commissioning information.
- 4. Submitter shall include a product page for each type(s) being submitted. The product page shall have all parts of the model number identified by highlighting or boxing in the specific components.

SUMMARY OF OTHER LIGHTING RELATED ITEMS BEING SUBMITTED:

1. This section is for battery packs, inverters or any other items that you would like us to consider where you believe that you have an equivalent product for us to consider. Again, please don't just include "generic" cutsheets – identify exactly what products you are submitting and if there are any differences that we should be aware of.

PROJECT NAME:						
PROJECT LOCATION:						
DATE SUBMITTED:						
BID DATE:						
ELECTRICAL ENGINEER:						
FIXTURE SCHEDULE SHEET:						
LIGHTING FIXTURE SUBSTITUTION REQUEST FOR CONSIDERATION:						
Note that if a fixture is approved in our addendum, light fixtures will be approved only with the TYPE and MANUFACTURER listed. It shall be the responsibility of the submitter to verify that all information contained within the submittals after bids are awarded matches the dimensions, lumen outputs, voltages, dimming types, warranties, etc.						
LIGHTING CONTROLS SUBSTITUTION REQUEST FOR CONSIDERATION:						
SUMMARY OF OTHER LIGHTING RELATED ITEMS BEING SUBMITTED:						

SECTION 260080 ELECTRICAL SCHEDULE OF VALUES

PART 1 GENERAL

1.01 FORM COMPLETION

- A. The successful Electrical Contractor shall complete this form in its entirety within 30 days of receipt of signed contract from the General Contractor, and submit directly to MODUS.
- B. This information is confidential and will not be disclosed to any individual outside of MODUS. Data collected will be used in evaluating pay applications.

1.02 OVERALL CONTRACT

Base Electrical Bid	\$
Add or deduct accepted alternates, negotiated changes, or other modifications to the contract Total Electrical Bid	\$ \$
1.03 SCHEDULE OF VALUES	
Utility Service Entrance - Material and Labor	\$
Electrical Distribution - Material and Labor	\$
Interior Lighting - Material and Labor	\$
Exterior Lighting - Material and Labor	\$
Wiring Devices - Material and Labor	\$
Lighting Control Devices - Material and Labor	\$
Total Electrical Bid (Sum of Schedule of Values)	\$

PART 2 PRODUCTS
NOT USED
PART 3 EXECUTION
NOT USED

SECTION 260090

MINOR ELECTRICAL DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements of the Contract Forms, the Conditions of the Contract, Division 1 - General Requirements and Specification Section 260050 - Basic Electrical Requirements "General Provisions" apply to this section.

1.02 SCOPE

- A. This contractor shall be responsible for the demolition and removal of all existing electrical elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be relocated".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
- B. Preserve services to the existing facility. Extend, reroute, and reconnect existing systems as required providing for the continued function of these systems.
- C. Demolition shall be accomplished by the proper tools and equipment for the work to be removed. Personnel shall be experienced and qualified in the type of work to be performed.
- D. This electrical contractor shall remove all abandoned equipment, conduit, supports, equipment curbs and bases associated with the remodeled area unless noted otherwise.
- E. This contractor is responsible to provide temporary electrical protection during this project.

1.03 MATERIALS

- A. All elements to be removed are subject to the Owner's Right of Salvage.
- B. All materials removed shall be the property of the removing contractor and shall be removed from the site by him, unless otherwise specified.
- C. The owner may designate and have salvage rights to any material herein demolished by this contractor. It will be the owner's responsibility to designate such salvageable items and remove them prior to the contractor working in that area.

1.04 WORK BY OTHERS

- A. Unless specifically noted under other contracts, the electrical contractor shall assume he will perform all required work. In general, the following will be performed by others:
 - 1. The mechanical contractor shall be responsible for the cutting and capping of all existing gas, water, sewer, and any other utility service.

1.05 EXISTING CONDITIONS

- A. If any existing fixtures or devices that are to remain are disturbed by operations under this contract, the contractor is required to re-establish continuity of such systems.
- B. The electrical contractor shall arrange for the general contractor to repair and patch all construction with material necessary to match surrounding due to removal of equipment and conduit.
- C. The electrical contractor shall furnish all required labor and material, where required, to extend new work to connect to similar work for extension of existing systems.
- D. Demolition plans are based on casual field observations and existing record documents. Report discrepancies to the owner before disturbing existing installation. Beginning of demolition means installer accepts existing conditions.
- E. This Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field-circuiting arrangements and reconnect as necessary.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities. Reconnect circuits, as required, to prevent de-energizing of remaining receptacles and lights.
- C. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to the owner before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.
- E. Review existing panels to remain in the area of construction. Notify the design team of any damaged circuit breakers or missing closure plates.
- F. Review existing lighting to remain in the area of construction. Notify the design team of any non-functional lamps, ballasts, or electrical parts.

3.02 PREPARATION

- Disconnect electrical systems in walls, floors, and ceilings scheduled for removal. Disconnect circuits at the source.
- B. Coordinate utility service outage with local utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits use personnel experienced in such operations. This shall include 600 volt or less systems and low voltage signal circuits.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchover connections. Obtain permission from the owner, at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections as required.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switch over and connections. Notify owner and local fire service at least 24 hours before partially or completely disabling the system. Minimize outage duration. Make temporary connections to maintain service within construction areas and in areas adjacent to work area.
- F. Existing Telephone System: Maintain existing system in service.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provisions of this section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide a blank cover for abandoned outlets that have not been removed.
- F. Disconnect and remove abandoned panelboards and distribution equipment.
- G. Disconnect and remove electrical devices and equipment serving utilization removed equipment.
- H. Disconnect and remove abandoned luminaires, brackets, stems, hangers, and other accessories. This contractor shall include in his bid, associated fees for disposal of ballasts and lamps.

- I. Repair adjacent construction and finishes damaged during demolition and extension work.
- J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- K. Extend existing installation using materials and methods compatible with existing electrical installations or as specified.
- L. The electrical contractor is responsible for removal of lamps and ballast from existing fixtures to be demolished. The electrical contractor is to properly dispose of these items in accordance with codes for hazardous materials.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials that remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Provide typed circuit directory showing revised circuiting arrangement.
- C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry.

3.05 INSTALLATION

A. Install relocated materials and equipment.

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rod electrode and conductors
- B. Mechanical connectors
- C. Wire
- D. Grounding well components

1.02 RELATED SECTIONS

A. Specification Section 270526 - Grounding and Bonding for Communication Systems

1.03 SUMMARY

- A. Provide all labor, materials, and equipment necessary to properly install a grounding system conductor in all new branch wiring and feeder installations, which shall be in full compliance with all applicable codes as accepted by the authorities having jurisdiction. The secondary distribution system shall include a grounding conductor in all raceways in addition to the return path of the metallic conduit.
- B. In general, all electrical equipment (metallic conduit, motor frames, panelboards, etc.) shall be bonded together with a green insulated or bare copper system grounding conductor in accordance with specific rules of Article 250 of the NEC and local codes. The bonding conductor through the raceway system shall be continuous from main switch ground bus to panel ground bar of each panelboard, and from panel grounding bar of each panelboard to branch circuit equipment and devices.
- C. All raceways shall have an insulated copper system ground conductor throughout the entire length of circuit installed within conduit in strict accordance with NEC. The grounding conductor shall be included in total conduit fill determining conduit sizes, even though not included or shown on drawings. All grounding conductors that run with feeders in PVC conduit outside of building shall be bare only.
- D. Provide and install all grounding and bonding as required by the National Electrical Code (NEC) including but not limited to Article 800 of the NEC.

1.04 REFERENCES

- A. ANSI/NFPA 70 National Electrical Code
- B. IEEE 837-2014: Standard for Qualifying Permanent Connections Used in Substation Grounding
- C. IEEE Emerald Book
- D. IEEE Green Book

1.05 PROJECT RECORD DOCUMENTS

- A. Submit record documents to accurately record actual locations of grounding electrodes.
- B. Submit test results of each ground rod.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

PART 2 PRODUCTS

2.01 ROD ELECTRODE AND CONDUCTORS

A. Material: Copper-clad steel.

B. Diameter: 5/8 inch.

- C. Length: 10 feet (min). Increase number and/or lengths of ground rod electrodes as required to meet and achieve specified resistance.
- D. Maintain separation of not less than eight foot (8') and not more than 20 feet between ground rod electrodes.

2.02 MECHANICAL CONNECTORS

- A. All grounding connectors shall be in accordance with UL 467 and UL listed for use with rods, conductors, reinforcing bars, etc., as appropriate.
- B. Connectors and devices used in the grounding systems shall be fabricated of copper or bronze materials, and properly applied for their intended use. All connectors and devices shall be compatible with the surfaces being bonded and shall not cause galvanic corrosion by dissimilar metals.
- C. Lugs: Substantial construction, of cast copper or bronze with "ground" (micro-flat) surfaces, twin clamp, and two-hole tongue equal to Burndy QQA Series.
- D. Grounding and Bonding Bushings: Malleable iron.
 - 1. Manufacturers:
 - a Thomas & Betts
 - b. Engineer approved equal.
- E. Piping Clamps: Burndy GAR-TC Series with a two-hole compression terminal.
- F. Grounding Screw and Pigtail: Raco #983.
- G. Building Structural Steel: Thompson #701 Series heavy duty bronze "C" clamp with two-bolt vise-grip cable clamp or equal.
- H. Mechanical lugs or wire terminals shall be used to bond ground wires together or to junction boxes and panel cabinets.

2.03 WIRE

- A. Material: Stranded copper.
- B. Size to meet NFPA 70 requirements as a minimum. Increase size if called for on drawings or in these specifications.
- C. Insulated THWN (or bare as noted elsewhere).

2.04 GROUNDING WELL COMPONENTS

- A. Well: 12"x12"x12" Eritech inspection well, Quazite box, or engineer approved equal.
- B. Well Cover: Bolt attachment, skid resistant with "GROUND" embossed on cover, suitable for designated traffic rating. Verify with engineer.
- C. Material: Polymer concrete with a minimum 10,000lb. load rating.
- D. Increase depth or size as required to provide proper access at installed location.

PART 3 EXECUTION

3.01 GENERAL

- A. Install products in accordance with manufacturer's instructions.
- B. Install grounding electrodes conductor, bonding conductors, ground rods, etc. with all required accessories.
- C. Grounding shall meet (or exceed as required to meet these specifications) all the requirements of the N.E.C., the NFPA, and applicable standards of IEEE.
- D. Where there is a conflict between these specifications and the above applicable codes/standards or between this section of these specifications and other sections, then the most stringent or excessive requirement shall govern. Where there is an omission of a code/standard requirement in these specifications then the current code/standard requirements shall comply.

E. Requirement in these specifications to comply with a specific code/standard article, etc. is not to be construed as deleting of requirements of other applicable codes/standards and their articles, etc.

3.02 GROUNDING ELECTRODES

- A. All connections shall be exothermic welded unless otherwise noted herein. All connections above grade and in accessible locations may be by exothermic clamping with devices UL listed as suitable for use except in locations where exothermic welding is specifically specified in these specifications or called for on drawings.
- B. Each rod shall be die stamped with identification of manufacturer and rod length.
- C. Install rod electrodes at locations indicated and/or as called for in these specifications.
- D. Ground Resistance:
 - 1. Main Electrical Service (to each building):
 - a. Grounding resistance measured at each main service electrode system and at each generator electrode system shall not exceed 5 ohms.
 - b. Other Locations:
 - Resistance to ground of all non-current carrying metal parts shall not exceed 5 ohms measured at motors, panels, busses, cabinets, equipment racks, light poles and other equipment.
 - 2) Resistance called for above shall be maximum resistance of each ground electrode prior to connection to grounding electrode conductor. Where ground electrode system being measured consists of two or more ground rod electrodes then the resistance specified above shall be the maximum resistance with two or more rods connected together but not connected to the grounding electrode conductor.
- E. Install additional rod electrodes as required to achieve specified resistance to ground (specified ground resistance is for each ground rod location prior to connection to ground electrode conductor).
 - Provide grounding well with cover at each rod location. Install grounding well top flush with finished grade.
 - 2. Verify that final backfill and compaction has been completed before driving rod electrodes.
 - 3. Install ground rods not less than one foot (1') below grade level and not less than two feet (2') from structure foundation.

3.03 GROUNDING ELECTRODE CONDUCTOR

A. Conductor shall be sized to meet or exceed the requirements of NEC 250 to meet these specifications and/or drawings.

3.04 GROUNDING CONDUCTORS

- A. Grounding conductors shall be provided with every circuit to meet (or exceed as required to meet these specifications and/or drawings) the requirements of NEC 250.
- B. At every voltage level, new portions of the electrical power distribution system shall be grounded with a dedicated copper conductor, which extends from termination back to power source in supply panelboard.
- C. Provide separate, insulated (bare if with feeder in PVC conduit outside of building) conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug.
- D. Except as otherwise indicated, each feeder raceway on the load side of the service entrance shall contain a ground conductor sized as indicated and where not shown shall be sized to meet (or exceed as required) these specifications and/or drawings the requirements of NEC 250. The conductor shall be connected to the equipment grounding bus in switchboards and panelboards, to the grounding bus in all motor control centers, and as specified to lighting fixtures, motors, and other types of equipment and outlets. The ground shall be in addition to the metallic raceway and shall be properly connected thereto, using a lug device located within each item enclosure at the point of electric power connections to permit convenient inspection.

- E. Provide green insulated ground wire for all receptacles and for equipment of all voltages. In addition to grounding strap connection to metallic outlet boxes, a supplemental grounding wire and screw equal to Raco No. 983 shall be provided to connect receptacle ground terminal to the box.
- F. All plug strips and metallic surface raceway shall contain a green insulation ground conductor from supply panel ground bus connected to grounding screw on each receptacle in strip and to strip channel. Conductor shall be continuous.
- G. Where integral grounding conductor is specified elsewhere in bus duct construction, provide equivalent capacity conductor from supply switchboard or panelboard grounding bus to the bus duct grounding conductor. Bond integral conductor to bus duct enclosure at each tap and each termination.
- H. All motors, all heating coil assemblies, and all building equipment requiring flexible connections shall have a green grounding conductor properly connected to the frames and extending continuously inside conduit with circuit conductors to the supply source bus with accepted connectors regardless of conduit size or type. This shall include food service equipment, laundry equipment, and all other "Equipment By Owner" to which an electric conduit is provided under this Division.

3.05 MAIN ELECTRICAL SERVICE

- A. Existing Buildings:
 - 1. The electrical contractor shall verify that each building's electrical service is properly grounded as required by the NEC.
 - 2. Provide and install electrical service grounding at each building as called for herein for all existing services that do not comply with the grounding specified above.
 - 3. Supplement existing electrical service grounding at each building as required to comply with all requirements in these specifications.
 - 4. If exterior ground rod electrode does not exist at each buildings main electrical service, provide and install these ground rods as called for main electrical service, exterior of building.
- B. Complete installation shall meet and exceed the requirements of the NEC 250.
- C. Artificial electrodes shall be provided for the main service in sufficient number and configuration to secure resistance specified.
- D. Bond To All Of The Following When Available On Site:
 - 1. Ground Rods.
 - 2. Metal Water Pipe (Interior and Exterior to Building)
 - 3. Building Metal Frame, Structural Steel and/or Reinforced Structural Concrete
 - 4. All Piping Entering or Leaving All Buildings.
 - 5. Provide a main ground, bare copper conductor, sized per applicable table in NEC 250, but in no case less than #2/0, shall be run in conduit from the main switchgear of each building to the building steel in each respective building. Reference NEC 250.104 (c). This ground conductor shall also be run individually from the main switchgear and be bonded to the main water service ahead of any union in pipe and must be metal pipe of length as acceptable by authorities having jurisdiction. Provide properly sized bonding shunt around water meter and/or dielectric unions in the water pipe.
- E. Ground/bond neutral per NEC 250.
- F. Provide and install ground bus bar on wall near main service disconnect/switchboard. Connect to ground bar in disconnect/switchboard bonded to switchboard/disconnect enclosure/neutral with copper grounding conductor sized per applicable table in NEC 250.

3.06 EXTERIOR GRADE MOUNTED EQUIPMENT

- A. General:
 - 1. All equipment (including chillers, pumps, disconnects, starters, control panels, panels, etc) mounted exterior to building shall have their enclosures grounded directly to a grounding

- electrode at the equipment location in addition to the building equipment ground connection.
- 2. Bond each equipment enclosure, metal rack support, mounting channels, etc. to ground electrode system at each rack with an insulated copper ground conductor sized to match the grounding electrode conductor required by applicable table in NEC 250 based on equipment feeder size, but in no case shall conductor be smaller than #6 copper or larger than #2 copper. This connection is in addition to grounding electrode connections required for services.
- B. Main Electrical Service Rack Mounted Equipment:
 - Ground per "MAIN ELECTRICAL SERVICE".
 - 2. Bond all metal parts as noted above.
- C. Electrical Sub Service Rack Mounted Equipment:
 - 1. Ground per "MAIN ELECTRICAL SERVICE", except do not bond neutral to ground.
 - 2. Bond all metal parts as noted above.
- Electrical Equipment Connection Rack Mounted Equipment: Bond all metal parts as noted above.
- E. Grounding Electrodes (Ground Electrodes System) shall be located at each rack location.
- F. Service Equipment: Ground electrode required per "MAIN ELECTRICAL SERVICE".
- G. Equipment Connection: Two or more ten foot (10') ground rods at no less than 30 foot spacing, driven vertical to a minimum depth of one foot (1') below grade. Bond the two or more ground rods together with a size to meet applicable table in NEC 250, but no less than a #2 copper ground conductor. Provide additional rod electrodes as required to achieve specified ground resistance.
- H. Complete installation shall exceed the minimum requirements of NEC 250 and, when applicable, NFPA 78.

3.07 LIGHT FIXTURES

- A. All new and removed/reinstalled fixtures in building interior, and exterior fixtures shall be provided with green grounding conductor, solidly connected to unit. Individual fixture grounds shall be with lug to fixture body, generally located at point of electrical connection to the fixture unit.
- B. All suspended fixtures and those supplied through flexible metallic conduit shall have green ground conductor from outlet box to fixture. Cord connected fixtures shall contain a separate green ground conductor.
- C. Installation shall exceed minimum requirements of NFPA 780.

3.08 MISCELLANEOUS GROUNDING CONNECTIONS

- A. Provide bonding to meet regulatory requirements.
- B. Required connections to building steel shall be with UL accepted non-reversible crimp type ground lugs exothermically welded to bus bar that is either exothermically welded or bolted to steel in locations where weld will affect the structural properties of the steel. Required connections to existing building structural steel purlins/i beams shall be with heavy duty bronze "C" clamp with two bolt vise-grip cable clamp.
- C. Grounding conductors shall be so installed as to permit shortest and most direct path from equipment to ground; be installed in conduit; be bonded to conduit at both ends when conduit is metal; have connections accessible for inspection; and made with accepted solderless connectors brazed or bolted to the equipment or to be grounded; in NO case be a current carrying conductor; have a green jacket unless it is bare copper; be run in conduit with power and branch circuit conductors. The main grounding electrode conductor shall be exothermically welded to ground rods, water pipe, and building steel.
- D. All surfaces to which grounding connections are made shall be thoroughly cleaned to maximum conductive condition immediately before connections are made thereto. Metal rust proofing

- shall be removed at grounding contact surfaces, for 0 ohms by digital Vm. Exposed bare metal at the termination point shall be painted.
- E. All ground connections that are buried or in otherwise inaccessible locations, shall be welded exothermically. The weld shall provide a connection which shall not corrode or loosen and which shall be equal or larger in size than the conductors joined together. The connection shall have the same current carrying capacity as the largest conductor.
- F. Install ground bushings on all metal conduits entering enclosures where the continuity of grounding is broken between the conduit and enclosure (i.e. metal conduit stub-up into a motor control center enclosure or at ground bus bar). Provide an appropriately sized bond jumper from the ground bushing to the respective equipment ground bus or ground bus bar.
- G. Install ground bushings on all metal conduits where the continuity of grounding is broken between the conduit and the electrical distribution system (i.e. metal conduit stub-up from wall outlet box to ceiling space. Provide an appropriately sized bond jumper from the ground bushing to the respective equipment ground bus or ground bus bar.
- H. Each feeder metallic conduit shall be bonded at all discontinuities, including at switchboards and all sub distribution and branch circuit panels with conductors in accordance with applicable table in NEC 250 for parallel return with respective interior grounding conductor.
- I. Grounding provisions shall include double locknuts on all heavy wall conduits.
- J. Bond all metal parts of pole light fixtures to ground rod at base.
- K. Install grounding bus in all existing panelboards of remodeled areas, for connection of new grounding conductors, connected to an accepted ground point.
- L. Bond together reinforcing steel and metal accessories in pool and fountain structures.
- M. Where reinforced concrete is utilized for building grounding system, proper reinforced bonding shall be provided to secure low resistance to earth with "thermite" type devices, and #10AWG wire ties shall be provided to not less than ten full length rebars that contact the connected rebar.

3.09 GROUNDING BAR INSTALLATION

- A. Mount bolt tapping lugs with hex head bolts to bus bar at two inch (2") on center spacing, one for each ground conductor.
- B. Mount bus bar to wall using two inch (2") polyester molded insulator stand-off.
- C. Extend a #2/0 (minimum size) or larger THWN insulated copper ground conductor (if larger size is called for on drawings or required by N.E.C. for service ground, etc.) in PVC conduit to accepted service ground installation or ground bus/bar in main service equipment enclosure.
- D. Extend #6 insulated copper ground wire from respective bus/bar to each 'local' ground bus/bar in each cabinet for the data and sound systems (if applicable).
- E. 'Systems' grounding bus/bar must be connected with #2/0 insulated copper conductor to grounding electrodes system as defined in NEC "Article 800-40(b).
- F. A separate grounding bar shall be installed in telecommunication rooms. Connect to the main electrical grounding bar with a #4/0 AWG grounding conductor in conduit.

3.10 TESTING AND REPORTS

- A. Raceway Continuity: Metallic raceway system as a component of the facilities ground system shall be tested for electrical continuity. Resistance to ground throughout the system shall not exceed specified limits.
- B. Ground resistance measurements shall be made on each system utilized in the project. The ground resistance measurements shall include building structural steel, driven grounding system, water pipe grounding system and other accepted systems as may be applicable. Ground resistance measurements shall be made in normally dry weather, not less than 24 hours after rainfall, and with the ground under test isolated from other grounds and equipment. Resistances measured shall not exceed specified limits.

3.11 INTERFACE WITH OTHER PRODUCTS

A. Interface with communications system installed under other specification sections.

3.12 FIELD QUALITY CONTROL

- Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Use suitable test instrument with current certificate of calibration to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method or signal injection method.

SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Product requirements
- B. Formed steel channel

1.02 REFERENCES

- A. NECA Standard of Installation (National Electrical Contractors Association)
- B. NFPA 70 National Electrical Code

1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

- A. Materials and Finishes:
 - 1. Corrosion resistant.
 - 2. Select materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit, including weight of wire in conduit.

B. Anchors and Fasteners:

- 1. Concrete Structural Elements: Use expansion anchors and preset inserts.
- 2. Steel Structural Elements: Use beam clamps and welded fasteners.
- 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
- Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
- 5. Solid Masonry Walls: Use expansion anchors and preset inserts.
- 6. Sheet Metal: Use sheet metal screws.
- 7. Wood Elements: Use wood screws.

C. Staples:

 Wood Elements: UV resistant polyethylene saddles. For use with non-metallic sheathed cable only.

2.02 FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. Globe Strut
 - 2. Uni-Strut
 - 3. Kindorf
 - 4. Power-Strut
 - 5. Engineer approved equal.
- B. Description: Galvanized steel.
- C. Provide aluminum supports and hangers in to support exposed EMT raceway conduit.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions and utility company regulations where applicable.
- B. Provide anchors, fasteners and supports in accordance with NECA "Standard of Installation".
 - 1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
 - 2. Do not use spring steel clips and clamps.

- 3. Do not use powder-actuated anchors.
- 4. Do not drill or cut structural members.
- C. Fabricate supports from structural steel or formed steel members or steel channel. Rigidly weld members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- D. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- E. Use steel channel supports to stand cabinets and panelboards one inch (1") off wall in all wet and damp locations.
- F. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- G. Reinforce outdoor concrete pads with 1/2 inch steel reinforcing bars on 12 inch centers or as shown on the drawings.
- H. All pathways and hangers shall be independently hung.

SECTION 260533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Conduit requirements
- B. Conduit types
- C. Box types
- D. Surface metal raceway types

1.02 REFERENCES

- A. ANSI C80.1 Rigid Steel Conduit, Zinc Coated
- B. ANSI C80.3 Electrical Metallic Tubing, Zinc Coated
- C. ANSI C80.5 Rigid Aluminum Conduit
- ANSI/NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies
- E. ANSI/NFPA 70 National Electrical Code
- F. NEMA 250 Enclosures for Electric Equipment
- G. NEMA WD 6 Wiring Device Configurations
- H. NEMA RN 1 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
- I. NECA (National Electrical Contractor's Association) Standard of Installation
- J. NEMA WD 6 Wiring Device Configurations
- K. TIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
- L. NEMA OS 2 Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2013 (ANSI/NEMA OS2)
- M. UL 514C- Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions

1.03 RELATED SECTIONS

- A. Specification Section 260543 Underfloor Ducts and Raceways for Electrical Systems
- B. Specification Section 27 0526 Grounding and Bonding for Communications Systems

1.04 PROJECT RECORD DOCUMENTS

- A. Accurately record actual routing of conduits larger than two inches.
- B. Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

1.05 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to the site.
- B. Accept products on site. Inspect for damage.

C. Protect products from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

1.08 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on the drawings.
- B. Verify routing and termination locations of conduit prior to rough in.
- C. Conduit routing is shown on the drawings in approximate locations unless dimensioned. Route as required completing the wiring system.

PART 2 PRODUCTS

2.01 CONDUIT REQUIREMENTS

- A. Minimum Size: 1/2 inch for power wiring and 1 inch for low voltage wiring unless noted otherwise.
- B. Size conduit per ANSI/NFPA 70.
- C. Above Grade Outdoor Locations: Use rigid steel and aluminum conduit. Aluminum conduit shall not contact concrete mortar or block.
- D. Wet and Damp Locations:
 - 1. Use rigid steel conduit and intermediate metal conduit.
 - 2. Use aluminum conduit and fitting in pool and pool equipment room.
- E. Dry Locations:
 - 1. Concealed: Use rigid steel conduit, intermediate metal conduit or electrical metallic tubing.
 - 2. Exposed: Use rigid steel conduit, intermediate metal conduit or electrical metallic tubing.

2.02 CONDUIT TYPES

- A. Metal Conduit:
 - 1. Rigid Steel Conduit: ANSI C80.1
 - 2. Rigid Aluminum Conduit: ANSI C80.5
 - 3. Intermediate Metal Conduit (IMC): Rigid steel
 - 4. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit.
- B. Flexible Metal Conduit:
 - 1. Description: Interlocked steel construction.
 - 2. Fittings: ANSI/NEMA FB 1.
- C. Liquidtight Flexible Metal Conduit:
 - 1. Description: Interlocked steel construction with PVC jacket.
 - 2. Fittings: ANSI/NEMA FB 1.
- D. Electrical Polyvinyl Chloride (PVC):
 - 1. Description: Synthetic Thermoplastic
 - 2. Fittings: NEMA TC3/UL 651
 - Joints: ASTM D2855 solvent weld with ASTM D2564 solvent cement.
- E. Electrical Metallic Tubing (EMT):
 - Description: ANSI C80.3; galvanized tubing.
 - 2. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression type with steel lock nut, and ring or steel setscrew fittings. Install compression type fittings in all wet and damp areas.
- F. Pre-manufactured Fixture Whips:
 - 1. Manufacturers:
 - a. Southwire
 - b. EPCO
 - c. Engineer approved equal.
 - Description: UL listed flexible conduit with conductors and die-cast screw connectors on the end.
 - 3. Size: no longer than 6', 3/8" diameter.

- 4. Wire: 14 AWG minimum for lighting and required by the load.
- 5. Install between junction box and light fixture only in concealed and unfinished spaces. Use interior raceway or surface raceway where exposed in finished spaces.
- G. Fittings and Conduit Bodies:
 - 1. NEMA TC 3
 - 2. Install offsets at surface boxes.
 - 3. Install single hole strap connectors on all exposed conduit one inch (1") and smaller.

2.03 BOX TYPES

- A. General Requirements:
 - Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide a low voltage partition divider plate for applications where low voltage and line voltage circuits share the same outlet box.
- B. Pull and Junction Boxes:
 - 1. Sheet Metal Boxes: NEMA OS 1 galvanized steel.
 - 2. Surface Mounted Cast Metal Box: NEMA 250, type #4 and #6, flat-flanged, surface mounted junction box:
 - a. Material: Galvanized cast iron.
 - 3. Cover: Furnish with ground flange, neoprene gasket and stainless steel cover screws.
 - 4. Fiberglass Hand Holes:
 - a. Die molded fiberglass hand holes.
 - b. Cable Entrance: Precut 6" x 6" cable entrance at center bottom of each side.
 - c. Cover: Fiberglass weatherproof cover with nonskid finish and light traffic rating.

2.04 SURFACE METAL RACEWAY TYPES

- A. Surface Metal Raceway:
 - 1. Manufacturers:
 - a. Wiremold #V500 or #V700
 - b. Hubbell
 - c. Engineer approved equal.
 - 2. Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway.
 - 3. Size as required or as indicated on drawings.
 - 4. Finish is to be ivory enamel.
 - 5. Color coat to be applied by others.
 - 6. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.
 - 7. Combination Device Box: Furnish Wiremold #V5748 Series.
- B. Surface Single Channel Metal Raceway:
 - 1. Manufacturers:
 - a. Wiremold #3000-access system.
 - b. Engineer approved equal.
 - 2. Description: Single channel with fitted cover, suitable for use as surface raceway.
 - 3. Size: 2-3/4" x 1-1/2" deep.
 - 4. Finish: Ivory scuff coat finish. Architect to verify color.
 - 5. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.
 - 6. Install receptacles as indicated on the drawings. Use Wiremold #V3000 style. Match raceway finish.
- C. Surface Dual Channel Metal Raceway:
 - 1. Manufacturers:
 - a. Wiremold #4000-access system.
 - b. Engineer approved equal.

- 2. Description: Dual channel with fitted cover, suitable for use as surface raceway.
- 3. Size: 4-3/4" x 1-3/4" deep.
- 4. Finish: Ivory scuff coat finish. Architect to verify color.
- 5. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.
- 6. Install receptacles as indicated on the drawings. Use Wiremold #4050 style with Wiremold #5507 series power and data devices. Match raceway finish.
- D. Multi-Outlet or Wiring Assembly:
 - Manufacturers:
 - a. Wiremold #2000
 - b. Engineer approved equal.
 - 2. Assembly: Sheet metal channel with fitted cover suitable for use as multi-outlet or wiring assembly.
 - 3. Size as indicated on the drawings.
 - 4. Receptacles: Provide covers and accessories to accept duplex receptacles. Receptacles, where indicated as plug mold, shall be spaced 18 inch on center. Install receptacles as indicated on the drawings. Match raceway finish.
 - 5. Channel Finish: Ivory scuff coat finish.
 - 6. Fittings: Furnish manufacturer's standard couplings, elbows, and connectors.

PART 3 EXECUTION

3.01 CONDUIT INSTALLATION

- A. Install conduit in accordance with NECA "Standard of Installation."
- B. Arrange supports to prevent misalignment during wiring installation.
- C. Support conduit using coated steel, malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related conduit support using conduit rack. Construct rack using steel channel and provide space on each for 25% additional conduits.
- E. Fasten conduit supports to building structure and surfaces.
- F. Do not support conduit with perforated pipe straps. Remove wire used for temporary supports.
- G. Do not use spring steel clips and clamps for support.
- H. Do not attach conduit to ceiling support wires.
- I. Arrange conduit to maintain headroom and present neat appearance.
- J. Route exposed conduit parallel and perpendicular to walls.
- K. Route conduit installed above accessible ceilings, parallel and perpendicular to walls.
- L. Route the conduit in and under slab from point-to-point.
- M. Do not cross conduits in slab.
- N. Maintain adequate clearance between conduit and piping.
- O. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degree F.
- P. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Use conduit hubs to fasten conduit to cast boxes.
- S. A run of conduit shall not contain more than the equivalent of four (4) quarter bends (360 degrees), including those bends located immediately at the outlet or body. Use conduit bodies to make sharp changes in direction (as around beams). Use hydraulic one-shot bender to fabricate bends in metal conduit larger than two inch (2") size. All conduit shall be held right to structure.
- T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.

- U. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.
- V. Provide suitable pull string in each empty conduit except sleeves and nipples.
- W. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- X. Ground and bond all conduits.
- Y. Identify conduit.
- Z. Use flexible and liquidtight conduits where required by NEC.
- AA. Flexible conduit up to six feet (6') in length can be used to connect mechanical equipment with motors, compressors, light fixtures or unless directed by engineer.
- AB. Install insulated bushings on all conduits and sleeves serving low voltage wiring prior to pulling wire unless otherwise noted.
- AC. Install grounded insulated bushings on all conduits and sleeves serving data wiring prior to pulling wire unless otherwise noted.
- AD. All low voltage conduits shall be sized to have less than 40% fill. Each penetration through a surface of any kind shall have a conduit sleeve with insulated bushings.
- AE. Junction boxes shall not be installed over four foot (4') above accessible ceiling without prior written approval by owner.
- AF. Conduits which enter communications entrance facilities shall extend 4 inches above the finished floor or 3 inches through the wall.
- AG. Minimum bend radius for communications conduits:
 - 1. For conduits 2" or less, maintain a minimum bend radius of (6) times the actual inside diameter of the conduit.
 - 2. For conduits greater than 2", maintain a minimum bend radius of (10) times the actual inside diameter of the conduit.
- AH. Communications conduits shall have no more than two (2) 90 degree bends between pull points and contain no continuous sections longer than 100 feet. Insert pull points or pull boxes for conduits exceeding 100 feet in length.
 - A third bend is acceptable if:
 - a. The total run is not longer than (33) feet.
 - b. The conduit size is increased to the next trade size.
- Al. No continuous section of conduit may exceed 100 feet. Utilize pull boxes as necessary. Refer to the pull box execution section for more information.
- AJ. All wiring in the same conduit shall be from the same source and have the same voltage except where approved by the owner.
- AK. Exterior rooftop pathways shall be supported above roofing membrane utilizing rubber type support bases with 12 ga. galvanized channel supports (Copper B-Line Dura-Block or equivalent). Adjust height as necessary for compliance with NEC.
- AL. For conduit installed in precast concrete walls or floors, it shall be acceptable to utilize Schedule 40 PVC conduit in lieu of EMT.

3.02 BOX INSTALLATION

- A. Install boxes in accordance with NECA "Standard of Installation."
- B. Install electrical boxes in locations as shown on the drawings and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- C. Set wall mounted boxes at elevations to accommodate mounting heights as indicated.
- D. Electrical boxes are shown on the drawings in approximate locations unless dimensioned. Adjust box location up to ten foot (10') if required to accommodate intended purpose. Verify with architectural drawings and elevations for additional information.
- E. Orient boxes to accommodate wiring device orientation.

- F. Maintain headroom and present neat mechanical appearance.
- G. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Junction boxes shall not be installed over four foot (4') above accessible ceilings.
- H. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than six inches (6") from ceiling access panel or from removable recessed luminaire.
- I. Fire-stop boxes to preserve fire resistance rating of partitions and other elements. Boxes may be installed within a minimum of 24 inch separation with written approval prior to installation.
- Coordinate mounting heights and locations of outlets mounted above counters, benches, and back splashes.
- K. Locate outlet boxes to allow luminaires positioned as shown on the drawings. If light fixture locations conflict with ceiling plans, the electrical contractor shall document discrepancies and send to the engineer for clarification.
- L. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- M. Use flush mounting outlet box in finished areas.
- N. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- O. Do not install flush mounting box back-to-back in wall, provide minimum six inch (6") separation.
- P. Provide minimum 24 inch separation for receptacles in acoustic rated walls. Provide sound blocking putty where lighting control devices are located in the same stud cavity.
- Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- R. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- S. Use adjustable steel channel fasteners for hung ceiling outlet box.
- T. Do not fasten boxes to ceiling support wires.
- U. Support boxes independently of conduit.
- V. Use gang box where more than one device is mounted together. Do not use sectional box.
- W. Use gang box with plaster ring for single device outlets.
- X. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- Y. Large Pull Boxes: Use set screw enclosure in interior dry locations, surface-mounted cast metal box in other locations.
- Z. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- AA. Group devices associated with each other eight inches (8") on center (i.e. receptacle, data, voice outlet).
- AB. All floor mounted device locations shall have a dimensioned drawing from the Architect prior to installation.

3.03 SURFACE RACEWAY INSTALLATION

- A. Install products in accordance with manufacturer's instructions. Provide all trim and accessories.
- B. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.
- C. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.
- D. Wire Way Supports: Provide steel channel.
- E. Close ends of wire way and unused conduit openings.
- F. Ground and bond raceway and wire way.

- G. Install surface metal raceway in exposed existing finished areas where indicated on the drawing. Coordinate all raceway routing with architect.
- H. Install dual channel metal raceway assemblies in computer areas.
- Install insulated bushings on all Wiremold terminated above accessible areas serving low voltage wiring prior to pulling wire unless otherwise noted.

3.04 PULLBOXES

A. Size communications cabling pull boxes according to the following:

Conduit Trade Size	Width	Length	Depth	Width Increase for Additional Conduit
1"	4"	16"	3"	2"
1-1/4"	6"	20"	3"	3"
1-1/2"	8"	28"	4"	4"
2"	8"	36"	4"	5"
2-1/2"	10"	42"	5"	6"
3"	12"	48"	5"	6"
4"	16"	60"	8"	6"

- B. Directional changes within a pullbox shall not be allowed. Conduit entering the box shall have conduit leaving the box from the opposite side. Do not use a pull box to make 90 degree turns.
- C. Install pullboxes in conveniently accessible locations.
- D. Where identified on drawings as lockable, key all pullboxes the same.
- E. Label all pull boxes. Handwritten labels shall not be accepted.

3.05 INTERFACE WITH OTHER PRODUCTS

- Install conduit using materials and method to preserve fire resistance rating of partitions and other elements.
- B. Piping and Ductwork: Route conduits through roof openings or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified.
- C. Coordinate installation of outlet and junction boxes for equipment connection.

3.06 ADJUSTING

- A. Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused box openings.

3.07 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates and labels
- B. Wire markers
- C. Conduit markers
- D. Underground warning tape
- E. Tracer wires
- F. Identification

1.02 REFERENCES

- A. NFPA 70 National Electrical Code
- B. NFPA 70E Standard for Electrical Safety in the Workplace

1.03 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 NAMEPLATES AND LABELS

- A. Nameplates:
 - 1. Normal power: Engraved three-layer laminated plastic white letters on black background.
- B. Locations:
 - All electrical distribution and control equipment enclosure.
 - a. Switchboards and Panelboards: Line 1 shall state "Panel Name"; Line 2 shall state "Fed by Panel Name" as required by NEC section 408.4(B).
 - 2. Communication cabinets.
 - 3. Fire alarm devices.
- C. Letter Size:
 - 1. Use 1/8 inch letters for identifying individual equipment and loads.
 - 2. Use 1/4 inch letters for identifying grouped equipment and loads.
 - 3. Use 1/4 inch letters for identifying communications cabinets.

2.02 WIRE MARKERS

- A. Description: Tape feeders to indicate phases.
- B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
- C. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated.
 - 2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams.

2.03 CONDUIT MARKERS

- A. Location: Mark conduit longer than 20 feet.
- B. Spacing: 30 feet on center.
- C. Color:
 - 1. 208 Volt System: Black
 - 2. Fire Alarm System: Red
 - 3. Other Systems: Green

- D. Legend:
 - 1. 208 Volt System: L- (name of feeder)
 - 2. Fire Alarm System: FA
 - 3. Telephone System: TS
 - 4. Computer System: CS

2.04 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Seaton
 - 2. Engineer approved equal.
- B. Description: Plastic four inch (4") wide tape, detectable type, colored RED with suitable warning legend describing buried electrical lines and inscribed "CAUTION ELECTRIC LINE BURIED BELOW".
- C. Location: Along length of each underground conduit.

2.05 TRACER WIRES

A. The electrical contractor shall provide a solid #10 AWG Tracer wire in each below grade conduit serving the electrical and communication systems. Tracer wires shall be labeled at each location of accessibility.

2.06 IDENTIFICATION

- A. Identify All Junction Boxes With Appropriate Marker As Follows:
 - 1. 208 Volt System: Black (circuit name and number)
 - 2. Fire Alarm System: Red
- B. Write the circuit number of each device inside the device box (not ON the device cover). All receptacles and light switches (new and existing) shall have the final circuit number installed on each device cover with a nylon label. Coordinate exact requirements with the owner prior to installation.
- C. Write the circuit information for each junction box inside the device box. Write the circuit number on the outside of each cover plate in unfinished or above ceiling spaces. Do not write on cover plate for junction box with permanent marker in any finished visible spaces. Use a permanent marker. Coordinate exact requirements with the owner prior to installation.
- D. Temporary label all outlets and switches with circuit numbers.

PART 3 EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive nameplates and labels.

3.02 INSTALLATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment front using screws.
- C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify conduit using field painting.
- E. Paint each conduit longer than 6 feet.
- F. Paint bands 20 foot on center.
- G. Identify underground conduits or wiring using one underground warning tape per trench at three inch (3") below finished grade.

SECTION 262416 PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Distribution panelboards
- B. Load centers

1.02 RELATED SECTIONS

- A. Specification Section 260526 Grounding and Bonding for Electrical System
- B. Specification Section 260553 Identification for Electrical Systems
- C. Specification Section 264313 Surge Protective Device

1.03 REFERENCES

- A. NECA Standard of Installation (published by the National Electrical Contractors Association)
- B. NEMA AB1 Molded Case Circuit Breakers
- C. NEMA ICS 2 Industrial Control Devices, Controllers and Assemblies
- D. NEMA KS1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
- NEMA PB 1 Panelboards E.
- NEMA PB 1.1 Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
- G. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the International Electrical Testing Association)
- H. NFPA 70 National Electrical Code

1.04 SUBMITTALS

- A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Record actual locations of panelboards and record actual circuiting arrangements in project record documents.
- D. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.
- It is the electrical contractors and suppliers responsibility to confirm the appropriate size and quantity of circuit breakers in the submitted panelboards with the information shown on the plan sheets, including the panelboard schedule, and the mechanical contractor prior to releasing the panelboards for construction.

1.05 QUALIFICATIONS

Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.06 REGULATORY REQUIREMENTS

- Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.07 RATINGS

A. Definitions:

- Fully rated equipment shall be defined as equipment where all devices in that equipment shall carry a minimum of the AIC rating that is specified. The distribution panels, panelboards, and load centers for this project shall be fully rated unless otherwise specifically noted in the Drawings or Specifications.
- Series rated equipment shall be defined as equipment that can achieve a required UL AIC rating with an upstream device such as a main breaker or a combination of devices to meet or exceed a required UL AIC rating. All series rated equipment shall have a permanently attached nameplate indicating that device rating must be maintained. See Section 26 0553 for additional requirements.

1.08 MAINTENANCE MATERIALS

A. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.01 DISTRIBUTION PANELBOARDS

- A. Manufacturers:
 - 1. Square D. I-Line
 - 2. General Electric
 - 3. Eaton (Cutler Hammer)
 - 4. Siemens
 - 5. Engineer approved equal.
 - 6. No engineer approved equal.
 - B. Description: NEMA PB1, circuit breaker type.
 - C. Service Conditions:
 - 1. Temperature: 40 deg F.
 - 2. Altitude: 1000 feet.
 - D. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
 - E. Minimum Integrated Short Circuit Rating: See schedule on the drawings.
 - F. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
 - G. Molded Case Circuit Breakers: NEMA AB 1, bolt-on or plug-on type thermal magnetic trip circuit breakers with common trip handle for all poles, listed as type #SWD for lighting circuits, type #HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Provide arc fault circuit breakers in all dwelling units as required by NEC Code. Do not use tandem circuit breakers. Handle ties to make multiple pole breakers are NOT permitted.
 - H. Molded Case Circuit Breakers with Current Limiters: NEMA AB 1, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole. Handle ties to make multiple pole breakers are NOT permitted.
 - I. Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes, let through current and energy level less than permitted for same size Class RK-5 fuse. Handle ties to make multiple pole breakers are NOT permitted.
- J. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.
- K. Enclosure: NEMA PB 1, type #1, cabinet box in accordance with code.
- L. Cabinet Front: Surface type, fastened with concealed trim clamps. Finish in manufacturer's standard gray enamel. Concealed hinge. Flush lock all keyed alike.

- M. Surge Protection Devices shall comply with Specification Section 26 4313 Surge Protection Devices
- N. Provide space for four future 200 amps, 3-phase circuit breakers unless more space is noted on the drawings.

2.02 LOAD CENTERS

- A. Manufacturers:
 - 1. Square D
 - 2. General Electric
 - 3. Eaton (Cutler Hammer)
 - 4. Siemens
 - 5. Engineer approved equal.
- B. Description: Circuit breaker load center with bus ratings as indicated.
- Load Center Bus: Copper, ratings as indicated. Provide copper ground bus in each load center.
- D. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical or as shown on panelboard schedule.
- E. Molded Case Circuit Breakers: NEMA AB 1, plug-on type thermal magnetic trip circuit breakers with common trip handle for all poles, listed as type #SWD for lighting circuits, Class A ground fault interrupter circuit breakers where required by NEC Code, in all wet areas and also where scheduled. Provide arc fault circuit breakers in all dwelling units as required by NEC Code. Do not use tandem circuit breakers. Handle ties to make multiple pole breakers are NOT permitted.
- F. Enclosure: General purpose.
- G. Box:
 - 1. Flush or with lock on door.
 - 2. Finish in manufacturer's standard gray enamel.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1 and the NECA "Standard of Installation."
- B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- C. Height is to be six feet (6') to top of the panelboard. Install panelboards taller than six feet (6') with bottom no more than four inch (4") above floor.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. Use actual room numbers and not plan room numbers. Coordinate with owner. Revise directory to reflect circuiting changes required to balance phase loads. Typed circuit directories shall be completed in Microsoft Excel. The electrical contractor shall submit a CD with all directories included.
- F. Provide engraved plastic nameplates under the provisions of Specification Section 260553 Identification for Electrical Systems.
- G. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling and to the floor below. Minimum spare conduits: Five empty one inch (1") at each recessed panel location. Identify each as SPARE.
- H. Ground and bond the panelboard enclosure.
- I. Any panel field modifications and associated means and methods shall be approved by the Authority Having Jurisdiction and the equipment manufacturer. Any costs associated shall be included in the bid.

J. It shall be the responsibility of the electrical contractor to verify all wire sizes with existing and new circuit breakers prior to ordering and installing so that specified wire will properly fit into the corresponding circuit breaker.

3.02 FIELD QUALITY CONTROL

- A. Inspect in accordance with NETA ATS.
- B. Perform inspections listed in NETA ATS.

3.03 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20% of each other. Maintain proper phasing for multi-wire branch circuits.

SECTION 262701 UTILITY SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metering transformer cabinets
- B. Meter bases

1.02 RELATED SECTIONS

A. Specification Section 261300 - Distribution Switchgear

1.03 REFERENCES

- A. NECA Standard of Installation National Electrical Contractors Association
- B. NFPA 70 National Electrical Code

1.04 SYSTEM DESCRIPTION

- A. System Characteristics: 208Y/120 volts, three phase, four-wire, 60 Hertz.
- B. Service Entrance: 200A.

1.05 SUBMITTALS

- A. Product Data: Provide ratings and dimensions of transformer cabinets and meter bases.
- B. Submit local utility company prepared drawings.

1.06 QUALITY ASSURANCE

- A. Utility Company: MidAmerican Energy Company.
- B. Perform work in accordance with local utility company's written requirements.
- C. Maintain one copy of each document on site.

1.07 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.08 PRE-INSTALLATION MEETING

A. Convene one week prior to commencing work of this section. Review service entrance requirements and details with local utility company's representative.

1.09 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on the utility company's drawings.

PART 2 PRODUCTS

2.01 METERING TRANSFORMER CABINETS

- A. Description: Sheet metal cabinet with hinged door, conforming to utility company requirements with provisions for locking and sealing.
- B. Size: As required by the local utility company.

2.02 METER BASES

A. The electrical contractor shall furnish meter base and meter socket with test switch in accordance with utility company requirements.

PART 3 EXECUTION

3.01 PREPARATION

A. Arrange with utility company to obtain permanent electric service to the project.

3.02 UTILITY FEES

- A. All fees by the utility company are to be included in the base bid by the electrical contractor.
- B. All fees by the utility company are to be billed directly to the owner.
- C. The contractor is required to assist the owner in the preparation of all utility company rebate forms that deal with equipment furnished and/or installed by this contractor.

3.03 INSTALLATION

A. Install metering transformer cabinets, meter socket with test switch and meter base as required by utility company. Provide primary conductor conduit for utility company per their requirements. Verify with utility prior to bidding.

SECTION 262713 ELECTRICITY METERING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Meter centers gangable
- B. Meter centers 2-6 position fixed

1.02 RELATED SECTIONS

A. Specification Section 260526 - Grounding and Bonding for Electrical System

1.03 REFERENCES

- A. ANSI C12 Code for Electricity Metering
- B. ANSI C39.1 Requirements for Electrical Analog Indicating Instruments
- C. ANSI C57.13 Requirements for Instrument Transformers
- D. NEMA AB 1 Molded Case Circuit Breakers
- E. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600-volt maximum)
- F. NEMA PB 2 Dead Front Distribution Switchboards
- G. NEMA PB 2.1 Instructions for Safe Handling, Installation, Operation and Maintenance of Dead Front Switchboards Rated 600 volts or Less
- H. NEMA 260 Safety Labels for Pad Mounted Switchgear and Transformers Sited In Public Areas
- I. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment (International Electrical Testing Association)
- J. NEPA 70 National Electrical Code

1.04 SUMMARY

A. This specification section includes service and Meter Centers rated 600 volt and less.

1.05 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. RFI: Radio-frequency interference.
- C. RMS: Root means square.
- D. SPDT: Single pole, double throw.

1.06 SUBMITTALS

- A. Product Data for Each Type of Switchboard: Over current protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated, include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings for Each Switchboard and Related Equipment:
 - 1. Shop drawings shall indicate front and side enclosure elevations with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; one-line diagrams; equipment schedule; and switchboard instrument details. Include the following:
 - a. Enclosure types and details for types other than UL891, type #1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of switchboards and overcurrent protective devices.
 - d. Utility company's metering provisions with indication of approval by utility company.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.07 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. The Meter Centers and overcurrent protection devices referenced herein are designed and manufactured according to the following appropriate specifications.
 - ANSI/NFPA 70 National Electrical Code (NEC).
 - 2. ANSI/IEEE C12.16 Solid-State Electricity Metering.
 - 3. ANSI C57.13 Instrument Transformers.
 - 4. NEMA AB 1 Molded Case Circuit Breakers and Molded Case Switches.
 - 5. NEMA PB 2 Deadfront Distribution Switchboards, File E8681.
 - 6. NEMA PB 2.1 Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.
 - 7. NEMA PB 2.2 Application Guide for Ground Fault Protective Devices for Equipment.
 - 8. UL 98 Enclosed and Dead Front Switches.
 - 9. UL 489 Molded Case Circuit Breakers.
 - 10. UL 891 Dead-Front Switchboards.
 - 11. UL 943 Standard for Ground Fault Circuit Interrupters.
 - 12. Federal Specification W-C-375B/Gen Circuit Breakers, Molded Case, Branch Circuit and Service.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver in sections or lengths that can be moved past obstructions in delivery path.
- B. Store indoors in clean dry space with uniform temperature to prevent condensation.
- C. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.
- D. If stored in areas subjected to weather, cover switchboards to provide protection from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside switchboards; install electric heating (250 W per section) to prevent condensation.
- E. Handle switchboards according to NEMA PB 2.1, NECA 400 and manufacturer's instructions.

1.09 COORDINATION

- A. Coordinate layout and installation of switchboards and components with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Architectural Specification.

PART 2 PRODUCTS

2.01 METER CENTERS GANGABLE

- A. Manufacturers:
 - 1. Square D.
 - 2. Eaton (Cutler-Hammer)
 - 3. General Electric
 - 4. Siemens
 - 5. Engineer approved equal.
- B. Interior Construction:
 - All components shall be factory assembled and all current carrying parts shall be plated bus bars.
 - 2. Individual units shall be constructed with an integral sliding one bolt joint-pak assembly for a completely bussed meter center. This single bolt is to be a VISI-TITE bolt for tightening without a torque wrench.

- C. Enclosure: Steel, UL 891, as shown on the drawings. No device disassembly is to be required prior to mounting. All devices shall be bonded together with bolted connections.
- D. Enclosure Finish: Factory-applied finish in manufacturer's standard ANSI 49 gray finish over a rust-inhibiting primer on treated metal surface.
- Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.
- F. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements. All compartments containing unmetered circuits shall be provided with a sealing means. Sockets shall be rated as shown on drawings. Meter socket jaws shall be spring reinforced and front removable.
- G. Phase-and Neutral-Bus Material: Hard-drawn copper of 98% conductivity with feeder circuit-breaker line connections.
- H. Copper Bus: Use copper for feeder circuit-breaker line connections.
- I. Bus Composition Shall be Plated Copper. Plating shall be applied continuously to all bus work. The Meter Center shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as shown on the drawings.
- J. Four-Wire Systems: The neutral shall be of equivalent ampacity as the phase bus bar. Tapered bus is not acceptable. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.
- K. Branch Molded Case Circuit Breakers:
 - 1. Circuit Breakers shall have integral crossbar to provide simultaneous opening of all poles in multipole circuit breakers.
 - 2. Breakers shall have an overcenter, tripfree, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication.
 - 3. Handles shall have ON, and OFF, and Tripped positions
 - 4. Circuit breakers shall be UL Listed in accordance with UL standard 489 with current ratings as noted on the plans. Interrupting ratings shall be selected to provide the required short circuit current rating.
- L. Short Circuit Current Rating: 10,000A ampere rms symmetrical short circuit current ratings shall be provided per the schedule. This rating shall be established by manufacturer testing of a representative meter center with branch overcurrent devices installed.

2.02 METER CENTERS 2-6 POSITION FIXED

- A. Manufacturers:
 - 1. Square D.
 - 2. Eaton (Cutler-Hammer)
 - 3. General Electric
 - 4. Siemens
 - Engineer approved equal.
- B. Interior Construction:
 - 1. All components shall be factory assembled and all current carrying parts shall be plated bus bars.
- C. Enclosure: Steel, UL 891, as shown on the drawings. No device disassembly is to be required prior to mounting.
- D. Enclosure Finish: Factory-applied finish in manufacturer's standard ANSI 49 gray finish over a rust-inhibiting primer on treated metal surface.
- E. Insulation and isolation for main bus of main section and main and vertical buses of feeder sections.
- F. Utility Metering Compartment: Fabricated compartment and section complying with utility company's requirements. All compartments containing unmetered circuits shall be provided with

- a sealing means. Sockets shall be rated as shown on drawings. Meter socket jaws shall be spring reinforced and front removable.
- G. Phase-and Neutral-Bus Material: Hard-drawn copper of 98% conductivity with feeder circuit-breaker line connections.
- H. Copper Bus: Use copper for feeder circuit-breaker line connections. All busing must be complete from the main lugs to meter socket and to the circuit breaker using Belleville, or equivalent, washers at all joints.
- I. Bus Composition Shall be Plated Copper. Plating shall be applied continuously to all bus work. The Meter Center shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as shown on the drawings.
- J. Four-Wire Systems: The neutral shall be of equivalent ampacity as the phase bus bar. Tapered bus is not acceptable. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.
- K. Branch Molded Case Circuit Breakers:
 - 1. Circuit Breakers shall have integral crossbar to provide simultaneous opening of all poles in multipole circuit breakers.
 - 2. Breakers shall have an overcenter, tripfree, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication.
 - 3. Handles shall have ON, and OFF, and Tripped positions
 - 4. Circuit breakers shall be UL Listed in accordance with UL standard 489 with current ratings as noted on the plans. Interrupting ratings shall be selected to provide the required short circuit current rating.
- L. Short Circuit Current Rating: 10,000A ampere rms symmetrical short circuit current ratings shall be provided per the schedule. This rating shall be established by manufacturer testing of a representative meter center with branch overcurrent devices installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine elements and surfaces to receive Meter Centers for compliance with installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install switchboards and accessories according to NEMA PB 2.1 and NECA 40.
- B. Install and anchor meter centers level on concrete bases of four inch (4") nominal thickness or on structurally supported walls.
- Install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor or walls.
- D. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- E. Install anchor bolts to elevations required for proper attachment to Meter Centers.
- F. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from Meter Center units and components.
- G. Any Meter Center field modifications and associated means and methods shall be approved by the Authority Having Jurisdiction and the equipment manufacturer. Any costs associated shall be included in the bid.

3.03 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Specification Section "Electrical Identification."

B. Meter Center Nameplates: Label each Circuit compartment with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.04 FIELD QUALITY CONTROL

- A. Prepare for Acceptance Tests as Follows:
 - 1. Test continuity of each circuit.

3.05 CLEANING

A. Upon completion of installation, inspect interior and exterior of Meter Centers. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

SECTION 262726 WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches
- B. Duplex receptacles
- C. Ground fault circuit interrupting receptacles
- D. USB charge duplex receptacles
- E. Simplex receptacles
- F. Wall plates
- G. General purpose contactor

1.02 RELATED REQUIREMENTS

- A. Specification Section 260533 Raceway and Boxes for Electrical Systems
- B. Specification Section 260543 Underfloor Ducts for Electrical Systems
- C. Specification Section 260923 Lighting Control Devices

1.03 REFERENCE STANDARDS

- A. NECA 1 Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2010
- B. NEMA WD 1 General Color Requirements for Wiring Devices; National Electrical Manufacturers Association: 1999 (R 2005)
- C. NEMA WD 6 Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R 2008)
- D. NFPA 70 National Electrical Code; National Fire Protection Association; 2011
- E. UL Standard 943 Standard for Safety for Ground-Fault Circuit Interrupters (GFCIs)

1.04 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Manufacturer's Installation Instructions.
 - 1. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
 - 2. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 Product Requirements, for additional provisions.
 - 2. Extra Wall Plates: One of each style, size, and finish.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 WALL SWITCHES

A. Description:

- 1. Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
- 2. Body and Handle: Impact-resistant plastic with toggle handle. Auto-grounding strap.
- 3. Ratings: Match branch circuit and load characteristics. Default rating is 20A, 120/277V, 1HP.
- 4. Wiring: Back and side wire connections. Accepts #14-#10 AWG solid and stranded copper conductors.
- 5. Provide #12 AWG solid pigtails at each device. Splice to building wire within outlet box.
- 6. Color: Selected during submittal phase. Provide color chart upon request.

B. Types:

- 1. Toggle Switches
 - a. Approved Manufacturers and Models:
 - 1) Pass & Seymour #PS20AC
 - 2) Cooper #2221
 - 3) Hubbell #1221
 - 4) Leviton #1221-2
 - b. Description: Single pole, double pole, 3-way, and 4-way toggle switches as indicated on plans.

2.02 DUPLEX RECEPTACLES

A. Description

- 1. Style: Hard use specification grade
- 2. Device Body: Impact resistant plastic with impact-resistant nylon face. Auto-grounding strap.
- 3. Configuration: NEMA WD 6, type as specified and indicated.
- 4. Rating: Match branch circuit and load characteristics. Default rating is 5-20R, 125V, 20A.
- 5. Standards: Receptacles comply with NEMA WD 6 and WD 1.
- 6. Wiring: Back and side wire connections. Accepts #14-#10 AWG solid and stranded copper conductors.
- 7. Provide #12 AWG solid pigtails at each device. Splice to building wire within outlet box.
- 8. Color: Selected during submittal phase. Provide color chart upon request.

B. Types

- 1. Duplex Receptacles
 - a. Manufacturers:
 - 1) Pass & Seymour #5362
 - 2) Cooper #5362C
 - 3) Hubbell #5362
 - 4) Leviton #5362-S
 - b. Description: Traditional style, hard use specification grade duplex receptacle with wraparound grounding/mounting strap.

2.03 GROUND FAULT CIRCUIT INTERRUPTING RECEPTACLES

- A. Receptacles: Complying with NEMA WD 6 and WD 1. Class A GFCI rated.
 - 1. Style: Hard use specification grade
 - 2. Device Body: Impact resistant plastic with impact-resistant nylon face. Auto-grounding strap.
 - 3. Configuration: NEMA WD 6, type as specified and indicated.
 - 4. Rating: Match branch circuit and load characteristics. Default rating is 5-20R, 125V, 20A.
 - 5. Standards: Receptacles comply with NEMA WD 6 and WD 1.
 - 6. Wiring: Back and side wire connections. Accepts #14-#10 AWG solid and stranded copper conductors.
 - 7. Provide #12 AWG solid pigtails at each device. Splice to building wire within outlet box.
 - 8. Color: Selected during submittal phase. Provide color chart upon request.

B. Types

1. GFCI Duplex Receptacles

- a. Manufacturers:
 - 1) Pass & Seymour #2097
 - 2) Cooper SGF20
 - 3) Hubbell GFRST20
 - 4) Leviton GFNT2
- b. Description: Specification grade duplex GFCI receptacle.
- c. Receptacles noted as "GFI" on plans.

2.04 USB CHARGE DUPLEX RECEPTACLES

- A. Receptacles: Complying with NEMA WD 6 and WD 1.
 - 1. Style: Hard use specification grade. Dual USB charging ports rated at a minimum of 3.5A.
 - 2. Device Body: Impact resistant plastic with impact resistant nylon face. Auto grounding strap.
 - 3. Ratings: Match branch circuit and load characteristics. Default rating is 5-20R, 125V, 20A.
 - Wiring: Three (3) pre-stripped 6" wire leads for line, neutral, and ground. Splice to building wire within outlet box.
 - 5. Color: Selected during submittal phase. Provide color chart upon request.
- B. USB Duplex Receptacle: Type A & C
 - 1. Manufacturers:
 - a. Hubbell USB20
 - b. Eaton
 - c. Pass & Seymour
 - d. Leviton
 - 2. Receptacles shall be Tamper Resistant in all areas as noted in the NEC 406.

2.05 SIMPLEX RECEPTACLES

- A. Description
 - 1. Style: Hard use specification grade
 - 2. Device Body: Impact resistant plastic with impact-resistant nylon face. Auto-grounding strap.
 - 3. Configuration: NEMA WD 6, type as specified and indicated.
 - 4. Rating: Match branch circuit and load characteristics. Default rating is 5-20R, 125V, 20A.
 - 5. Standards: Receptacles comply with NEMA WD 6 and WD 1.
 - Wiring: Back and side wire connections. Accepts #14-#10 AWG solid and stranded copper conductors.
 - 7. Provide #12 AWG solid pigtails at each device. Splice to building wire within outlet box.
 - 8. Color: Selected during submittal phase. Provide color chart upon request.

2.06 WALL PLATES

- A. Standard Cover Plates:
 - 1. Type 302 stainless steel cover plates. Cover plate style to be confirmed during submittal phase.
 - 2. Basis of Design: Pass & Seymour #SS (Metal), to be confirmed during submittal phase.
 - 3. Provide coverplate for all devices and provide multiple gang plates where required.
- B. Weatherproof Box & Cover:
 - 1. 1. Basis of Design: Pass & Seymour #WIUC10.
 - a. Description: Heavy-duty polycarbonate NEMA 3R "While-In-Use" weatherproof box and cover. Installed horizontally.
 - b. Complies with all 2017 NEC 406.8(B)(1) requirements for wet location covers.
 - c. Provide with plate kits as required.
 - d. Provide multi-gang or deep cover configurations as required for application.
 - e. Cover shall be capable of accepting a standard size padlock.
 - f. Color shall be gray, to be confirmed during submittal phase.
 - g. Indicated by "WP" on plans.

2.07 GENERAL PURPOSE CONTACTOR

- A. Contactors: NEMA ICS 2 and UL 508; electrically held, 30 amps rated.
- B. Coil Operating Voltage: 120 volts, 60 Hertz.
- C. Poles: 6, Normally closed.
- D. Enclosure: ANSI/NEMA ICS 6; NEMA Type 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that outlet and switch boxes are installed at proper height.
- B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that floor boxes are adjusted properly.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.02 PREPARATION

- A. Provide extension rings as needed to bring outlet and switch boxes flush with finished surface.
- B. Clean debris from outlet and switch boxes prior to device installation.

3.03 INSTALLATION

- A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install devices plumb and level.
- C. Install switches with OFF position down.
- D. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- E. Install receptacles with grounding pole on top.
- F. Connect wiring device grounding terminal to outlet box with bonding jumper.
- G. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- H. Connect wiring devices by wrapping conductor around screw terminal.
- I. Use oversize plates for outlets installed in masonry walls.
- J. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- K. The electrical contractor shall verify floor finish and location before ordering floor devices.
- L. The feeding of receptacles downstream of GFI receptacles for protection in lieu of providing multiple GFI receptacles is NOT allowed.

3.04 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 26 0533 to obtain mounting heights specified.
- B. Install wall switches 48 inches above finished floor.
- C. Install convenience receptacle 18 inches above finished floor.
- D. Install above-counter convenience receptacle 6 inches above counter.
- E. Install telephone jack 18 inches above finished floor.
- F. In masonry walls, switches and receptacle heights shall be adjusted as required such that outlets are at nearest mortar joint to specified height.
- G. Coordinate the installation of wiring devices with underfloor duct service fittings provided under Section 26 0543.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.
- B. Inspect each wiring device for defects.
- C. Operate each wall switch with circuit energized and verify proper operation.
- D. Verify that each receptacle device is energized.
- E. Test each receptacle device for proper polarity.
- F. Test each GFCI receptacle device for proper operation.

3.06 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.07 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

3.08 EXTRA MATERIALS AND LABOR

A. The electrical contractor shall include in their bid an allowance to install an additional two duplex receptacles including an average 50 feet of raceway, associated wiring, back box and labor, and all accessories required to energize each receptacle requested. Receptacle(s) may be added anytime during the construction process as requested by the owner or design team. Any unused devices shall be turned over to the owner at the final acceptance of building.

SECTION 262816

ENCLOSED STARTERS AND SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Safety Switches
- B. Motor-Rated Starters and Switches

1.02 RELATED REQUIREMENTS

- A. Specification Section 260529 Hangers and Supports for Electrical Systems
- B. Specification Section 260553 Identification for Electrical Systems
- C. Specification Section 262813 Fuses

1.03 REFERENCE STANDARDS

- A. NEMA FU 1 Low Voltage Cartridge Fuses; National Electrical Manufacturers Association
- B. NEMA KS 1 Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association
- C. NETA STD ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association
- D. NFPA 70 National Electrical Code; National Fire Protection Association
- E. NECA Standard of Installation (published by the National Electrical Contractors Association)

1.04 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide switch ratings and enclosure dimensions.
- C. Project Record Documents: Record actual locations of enclosed switches.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of Project.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 SAFETY SWITCHES

- A. Manufacturers
 - 1. Square D
 - 2. General Electric
 - 3. Cutler-Hammer
 - 4. Siemens
 - 5. Engineer approved equal.
 - 6. No engineer approved equal.
- B. Heavy duty safety switches shall be used for all motor loads over 1 HP and all non-motor loads 20 amps and greater.
 - 1. Fusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
 - Externally operable handle interlocked to prevent opening front cover with switch in ON position.
 - b. Handle lockable in OFF position.
 - c. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses, with rejection clips designed to permit installation of Class R fuses only.

- d. Indicated as a disconnect switch with a "F" on the drawings.
- Nonfusible Switch Assemblies: NEMA KS 1, Type HD enclosed load interrupter knife switch.
 - a. Externally operable handle interlocked to prevent opening front cover with switch in ON position.
 - b. Handle lockable in OFF position.
- 3. Enclosures: NEMA KS 1.
 - a. Interior Dry Locations: Type 1.
 - b. Exterior Locations: Type 3R.
 - Enclosures shall be provided with a method of opening the cover without opening the switch.
- 4. Enclosure shall include a grounding bar.

2.02 MOTOR-RATED STARTERS AND SWITCHES

- A. Manufacturers
 - 1. Square D
 - 2. General Electric
 - 3. Cutler-Hammer
 - 4. Siemens
 - 5. Cooper-Bussmann
 - 6. Engineer approved equal.
- B. Motor-rated starters and switches may be used for all motor loads 1 HP and less and all non-motor loads under 20 amps.
 - 1. Motor-Rated Switch with Fuseholder
 - a. Basis of Design: Cooper-Bussmann "STY".
 - b. Description: Motor-rated toggle switch disconnecting means with plug fuseholder.
 - c. Fuseholder: Designed to accommodate plug fuses. Provide fuse sized per NEC 430.
 - d. For use with single-pole motors only.
 - 2. Nonfusible Motor-Rated Starter
 - a. Basis of Design: Square D "Type F".
 - b. Description: Fractional horsepower manual starter with melting alloy type thermal overload relay.
 - c. Handle lockable in OFF position.
 - d. Current rating: 16A
 - e. For use with single-phase motors only.
 - f. Provide and install thermal units sized per NEC 430.
 - 3. Nonfusible Motor-Rated Switch
 - a. Basis of Design: Square D "Type K".
 - b. Description: Fractional horsepower manual switch with melting alloy type thermal overload relay.
 - c. Handle lockable in OFF position.
 - d. Current rating: 30A
 - e. For use with single or three phase motors.
- C. Motor-rated starters may be used for all motor loads 1 HP and greater.
 - 1. Nonfusible Motor-Rated Starter
 - a. Basis of Design: Square D "M Type"
 - b. Description: Intergral horsepower manual starter switch with melting alloy type thermal overload with auxiliary contact.
 - c. ON-OFF position
 - d. For use with single-phase or three phase motors or pumps only.
 - e. Provide and install thermal units sized per NEC 430.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation."
- B. Install in accordance with manufacturer's instructions.
- C. Install plumb and provide in accordance with Specification Section 26 0529 Hangers and Supports for Electrical Systems.
- D. Height to be five foot (5') to operating handle.
- E. Install fuses in fusible disconnect switches. Fuses shall not be installed until equipment is ready to be energized.
- F. Provide one set of spare fuses of each size and type.
- G. Provide adhesive lavel with white letters on black background for associated equipment.
- H. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.02 FIELD QUALITY CONTROL

- A. Perform field inspection in accordance with Section 01 4000.
- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.5.1.2.

SECTION 262923

VARIABLE FREQUENCY MOTOR CONTROLLER

PART 1 GENERAL

1.01 SCOPE

- A. All variable frequency motor controllers that are not integral to factory furnished equipment such as air handlers, chillers, pump skids, etc., must be provided by the electrical contractor.
- B. The facilities management system (FMS) contractor must provide all low voltage control wiring and cabling required to interface the FMS with the variable frequency motor controllers.

1.02 SECTION INCLUDES

A. Variable frequency motor controller to include a variable frequency drive (VFD) and a VFD bypass.

1.03 RELATED SECTIONS

A. Specification Section 23 0993 - Sequence of Operation

1.04 REFERENCES

- A. NEMA ICS 7 Industrial Control and Systems: Adjustable Speed Drives.
- B. NEMA ICS 7.1 Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems.
- C. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. NETA ATS Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).
- E. NFPA 70 National Electrical Code.
- F. UL 508C Standard for Power Conversion Equipment.
- G. UL 61800-5-1 Standard for Adjustable Speed Electrical Power Drive Systems Part 5-1: Safety Requirements Electrical, Thermal and Energy

1.05 SUBMITTALS

- A. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and over current protective devices, short circuit ratings, dimensions, and enclosure details.
- B. Shop Drawings: Indicate front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.
- C. Test Reports: Indicate field test and inspection procedures and test results.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Manufacturer's Field Reports: Indicate start-up inspection findings.
- F. Operation Data: NEMA ICS 7.1. Include instructions for starting and operating controllers, and describe operating limits that may result in hazardous or unsafe conditions.
- G. Maintenance Data: NEMA ICS 7.1. Include routine preventive maintenance schedule.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Products: UL or ETL Listed Mark to demonstrate product as suitable for the purpose specified and indicated.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept controllers on site in original packing. Inspect for damage.

- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to components, enclosure, and finish.

1.08 WARRANTY

A. Provide parts and labor warranty of variable frequency motor controller for one year from date of substantial completion of project or 18 months after date of shipment from manufacturer, whichever is sooner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB
- B. Danfoss
- C. Siemens
- D. Toshiba
- E. Yaskawa
- F. No engineer approved equal

2.02 DESCRIPTION

- A. Enclosed variable frequency controllers suitable for operating the indicated loads, in conformance with requirements of NEMA ICS 7.
- B. Select unspecified features and options in accordance with NEMA ICS 7.1.

2.03 RATINGS

- A. Rated Input Voltage: See schedule.
- B. Motor Nameplate Voltage: See schedule.
- C. Displacement Power Factor: Between 1.0 and 0.95, lagging, over entire range of operating speed and load.
- D. Operating Ambient: 0 deg C to 40 deg C.
- E. Provide equipment which complies with UL508C or UL 61800-5-1.

2.04 DESIGN FEATURES

- A. VFD must use microprocessor-based inverter logic isolated from power circuits.
- B. VFD must use variable torque pulse-width-modulated inverter system.
- C. VFD must have ability to operate at full load and have motor disconnected from output without damage to the system.
- D. VFD must attempt five automatic restarts following fault condition before locking out and requiring manual restart.
- E. VFD must catch and run forward a reverse rotating load.
- F. VFD and VFD bypass (variable frequency motor controller) to have short circuit withstand rating of at least 65K RMS symmetrical Amps.
- G. VFD must be field programmable to skip two adjustable width frequency bands.
- H. VFD must have a field programmable carrier frequency adjustable up to at least 15 KHz.
- I. VFD must have a P+I controller that can modulate the VFD speed to maintain a set point and use a field provided 4-20 mA or 0-10 Vdc transmitter.

2.05 PRODUCT OPTIONS AND FEATURES

 Display: Provide integral digital display to indicate output voltage, output frequency, and output current.

- B. Status Indicators: Separate indicators for over current, over voltage, ground fault, over temperature, and input power ON.
- C. Volts Per Hertz Adjustment: +/- 10%
- D. Current Limit Adjustment: 60% 110% of rated.
- E. Acceleration Rate Adjustment: 0.5 30 seconds.
- F. Deceleration Rate Adjustment: 1 30 seconds.
- G. Input Speed Signal: 4 20 mA and 0-10 Vdc.
- H. Under voltage release.
- I. Control Power Source: Integral control transformer.
- J. Door Interlocks: Provide mechanical means to prevent opening of equipment with power connected, or to disconnect power if door is opened; include means for defeating interlock by qualified persons.
- K. Safety Interlocks: Provide terminals for remote contact to inhibit starting under both manual and automatic mode.
- L. Control Interlocks: Provide terminals for remote contact to allow starting in automatic mode.
- M. VFD Bypass: Provide HOA switch, contactor, motor running overload protection, and short circuit protection for full voltage, non-reversing operation of the motor. Provide isolation switch to allow maintenance of VFD during bypass operation. Provide terminals for field provided safety interlock that can shut down the VFD and VFD bypass.
- N. Disconnecting Means: Include integral disconnect switch on the line side of each controller.
- O. Output Filter: Provide 5% load reactor when output lead length is over 150 feet.
- P. Input Filter: Provide 3% input AC line reactor.

2.06 FMS INTERFACE

- A. Provide the VFD with a communication interface to the FMS.
- B. The VFD must have enough internal logic and memory to respond to control and monitoring by the FMS.
- C. The interface must use BACnet MS/TP or MODBUS RTU communication protocol.
- D. The interface may alternately use Johnson N2 or Siemens Apogee FLN communication protocol at the request of the FMS contractor.

2.07 FABRICATION

- A. Wiring Terminations: Match conductor materials and sizes indicated.
- B. Enclosure: NEMA 250, Type 1, suitable for equipment application in places restricted to persons employed on the premises.
- C. Finish: Manufacturer's standard enamel.

2.08 SOURCE QUALITY CONTROL

A. Shop inspect and perform standard productions tests for each controller.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surface is suitable for controller installation.
- B. Do not install controller until building environment can be maintained within the service conditions required by the manufacturer.
- C. Verify that field measurements are as indicated on shop drawings.

3.02 INSTALLATION

A. The electrical contractor is responsible for the installation items.

- B. Install in accordance with NEMA ICS 7.1.
- C. Make sure that the motor(s) rotate in correct direction when VFD and VFD bypass are used.
- D. Tighten accessible connections and mechanical fasteners after placing controller.
- Select and install overload heater elements in motor controllers to match installed motor characteristics.
- F. Provide engraved plastic nameplates. Refer to Specification Section 23 0553 Identification for HVAC Piping and Equipment for product requirements and location.
- G. Neatly type label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating. Place in clear plastic holder.

3.03 FIELD QUALITY CONTROL

- A. Inspect in accordance with NETA ATS.
- B. Perform inspections listed in NETA ATS.

3.04 MANUFACTURER'S FIELD SERVICES

A. Provide as many start up sessions as are required for phasing.

3.05 ADJUSTING

A. Make final adjustments to installed controller to assure proper operation of loads. Obtain performance requirements from installer of loads.

3.06 DEMONSTRATION

- A. Demonstrate operation of VFD in automatic and manual modes.
- B. Demonstrate operation of VFD bypass.

SECTION 265100 INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Light Emitting Diodes (LEDs)

1.02 REFERENCES

- A. ANSI C78.379 American National Standard for Electric Lamps -- Reflector Lamps --Classification of Beam Patterns; 1994 (R 2003)
- B. ANSI C82.1 American National Standard for Lamp Ballast Line Frequency Fluorescent Lamp Ballast; 2004
- C. NECA/IESNA 500 Recommended Practice for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association
- D. NECA/IESNA 502 Recommended Practice for Installing Industrial Lighting Systems; National Electrical Contractors Association
- E. NEMA WD 6 Wiring Devices Dimensional Requirements; National Electrical Manufacturers Association
- F. NFPA 70 National Electrical Code; National Fire Protection Association
- G. NFPA 101 Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association
- H. IESNA LM-79-08 Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products
- I. IESNA LM-80-08 Approved Method for Measuring Lumen Maintenance of LED Light Sources.
- J. IESNA TM-21-11 Projecting Long Term Lumen Maintenance of LED Light Sources
- K. EU Directive 2002/95/EC Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS), as amended by directive 2005/618/EC

1.03 SUBMITTALS

- Provide cut sheet indicating dimensions and components for each luminaire.
- B. Provide ballast/driver schedule for all ballasts/drivers used. Include manufacturer's data sheet for each type of ballast.
- C. Provide lamp/board schedule for all lamps/boards used. Include manufacturer's data sheet for each type of lamp.
- D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Submit manufacturer's operation and maintenance instructions for each product.
- F. All lighting submittals must be on Local Authorized Manufacturer Representative's letterhead and contain Project Name and Location.

1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70 and NFPA 101.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.05 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70 and 101

- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- C. Products with Light Emitting Diodes:
 - Fixtures shall comply with LM-79-08: Electrical and Photometric Measurements of Solid-State Lighting Products.
 - 2. Interior fixture diode arrays shall maintain +/-100 degrees Kelvin (K); exterior fixture diode arrays shall maintain +/- 500 K color temperature range through the life of the fixture.
 - 3. Diode arrays shall be wired so that if one diode fails, at least 90% of the remaining diodes will operate.

PART 2 PRODUCTS

2.01 LIGHT EMITTING DIODES (LEDS):

- A. Manufacturers
 - 1. Nichia
 - 2. Lumileds
 - 3. Cree
 - 4. Samsung
 - 5. Citizen
 - 6. Engineer approved equals.
- B. Light Emitting Diodes shall be provided with a driver as a modular replaceable system. The system shall be fully designed and tested for operation throughout warranted period.
- C. Diode arrays shall maintain +/-100K color temperature through the life of the fixture.
- D. Diodes shall have a minimum color rendering index of 78.
- E. Diodes and associate circuitry shall be RoHS compliant.
- F. Diodes shall be photometrically tested for compliance with IESNA LM-80-08, with projections calculated in accordance with IESNA TM-21-11.
- G. Diode arrays shall maintain 70% lumen output through an average operating life of 50,000 hours.
- H. Diodes and associated printed circuit boards shall be RoHS compliant.
- I. Refer to Lighting Fixture Schedule for color temperature requirements.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Furnish products as specified in schedule on the drawings.
- C. Install ballasts, lamps, and specified accessories at factory.
- D. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required suspending luminaire at indicated height.
- E. Locate recessed ceiling luminaires as indicated on reflected ceiling drawing and electrical lighting drawings.
- F. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- G. Install recessed luminaires to permit removal from below.
- H. Install recessed luminaires using accessories and fire stopping materials to meet regulatory requirements for fire rating.
- I. Install clips to secure recessed grid-supported luminaires in place.
- J. Install recessed can luminaires to fit in ceiling. Provide all necessary trim ring extenders or other accessories for proper installation of luminaire in ceiling.

- K. Install wall mounted luminaires, emergency lighting units and exit signs at height as scheduled.
- L. Install accessories furnished with each luminaire.
- M. Fixture whips utilizing THHN/THWN-2 wire in flexible metal conduit shall be used to connect all luminaires, emergency lights, and exit signs. Minimum wire size for all fixture whips shall be 14 AWG. Fixture whips shall be wired directly from the luminaire to an accessible junction box. Fixture to fixture whips are not allowed. Maximum length for any fixture whip shall be 6'.
- N. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- O. Bond products and metal accessories to the branch circuit equipment grounding conductor.
- P. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.
- Q. Exposed Grid Ceilings: Support surface mounted luminaires on grid ceiling directly from building structure. Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires.
- R. Support luminaires larger than 2' x 4' size independent of ceiling framing.

3.02 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.03 ADJUSTING

- A. Aim and adjust luminaires as directed.
- B. Position exit sign directional arrows as indicated.

3.04 WARRANTIES

- A. All warranties shall remain as an agreement between the installing contractor and the manufacturer. No third parties shall be involved with warranty repairs or replacements of installed products without the written consent of the installing contractor and the owner or their representative.
- B. Labor for warranty repairs shall be billed by the contractor directly to the manufacturer or distributor during the duration of the labor warranty on the originally installed products. Labor work required on warrantied parts, but outside of the 1-year labor warranty shall be the responsibility of the owner.

3.05 CLEANING

- A. Clean all electrical parts to remove all of the conductive and deleterious materials.
- B. Remove dirt and debris from enclosures.
- C. Clean photometric control surfaces as recommended by manufacturer.
- D. Clean finishes and touch up damage.

3.06 PROTECTION OF FINISHED WORK

A. Re-lamp all luminaires that have failed lamps within 6 months after the substantial complete date.

3.07 SCHEDULES

A. See the drawings.

3.08 EXTRA MATERIAL AND LABOR

A. The electrical contractor shall include in their bid an allowance to install an additional two emergency lights and two emergency exit signs of each type as scheduled including an average 50 feet of raceway, associated wiring, back box and labor, and all accessories required to energize each device requested. Fixture(s) may be added anytime during the construction process as requested by the owner or design team. See schedule on drawings for types. Any materials that are not used during construction shall be turned over to the owner at the final acceptance of the building.

B. Drivers:

- 1. Extra materials shall be turned over to the owner at substantial completion in their original unopened packaging.
- 2. All drivers shall be clearly marked for the fixture types that they are compatible with based on the drawings, fixture schedule and submittals received.
- 3. Extra drivers included in this requirement shall not be used for warranty replacements without replacing this extra stock in the owner's inventory.
- 4. No labor should be added to the project over the standard warranties already required in previous sections.

SECTION 265600 EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Luminaries and accessories
- B. Light emitting diodes (LEDs)

1.02 REFERENCES

- A. IES RP-8-14 Recommended Practice for Roadway Lighting
- B. IES RP-20-14 Recommended Practice for Lighting for Parking Facilities
- C. IES RP-33-14 Recommended Practice for Lighting for Exterior Environments
- D. NFPA 70 National Electrical Code
- E. ANSI C78.377 SSL Chromaticity Specification
- F. NEMA SSL 3-2011 High-Power White LED Binning for General Illumination
- G. IES LM-79-08 Electrical and Photometric Measurements of Solid-State Lighting Products
- H. IES LM-80-08 Approved Method for Lumen Maintenance Testing of LED Light Sources
- IES TM-21-11 Projecting Long Term Lumen Maintenance of LED Light Sources
- J. IES LM-82-12 Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature.
- K. IES TM-15-11 Luminaire Classification System for Outdoor Luminaires (BUG ratings)
- L. NFPA 101 Life Safety Code

1.03 TERMS AND DEFINITIONS

- A. ANCHOR BASE Base plate used to anchor poles to pole footing.
- B. ANNODIZED Electro-chemical process that produces a very strong oxide coating on the surface of the pole. This coating shall be very resistant to scratches and corrosion.
- C. ANTI-GRAFFITI A coating applied to the finished pole that allows easy removal of painted graffiti. Graffiti shall be able to be removed with manufacturer approved solvents without harming manufacturer's paint finish.
- D. BUG RATING Backlight, Uplight, Glare. Replaces the old system of cut-off, semi-cut-off and not cut-off.
- E. EPA Effective Projected Area of a luminaire which is its actual projected area times its coefficient of drag.
- F. GROUNDING PROVISION A drilled and tapped hole located near the hand hole to allow attachment of the ground connection and grounding wire.
- G. MOUNTING HEIGHT The height measured from finished grade level to the position of the luminaire on the pole.
- H. POWDERCOAT PAINT An electrostatically applied powder paint that is then oven cured on to the pole.

1.04 SUBMITTALS

- A. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- B. Product Data: Provide dimensions, ratings, and performance data.
- C. Test Reports: Submit LM-79 test reports and/or DLC paperwork as required for rebates
- D. Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include

- instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- E. Provide maintenance data for each luminaire.
- F. Provide additional light fixture components including driver cutsheets with each fixture.
- G. All lighting submittals must be on Local Authorized Manufacturer Representative's letterhead and contain Project Name and Location.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70 and NFPA 101.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- D. Electrical Contractor shall be responsible for all costs associated with the installation of the pole footing and the footing itself in their bid. Coordinate means and methods and actual coordinate locations with contractor and design team prior to commencing work.
- E. Refer to Poured in Place Concrete specification for required mix. It is the Contractor's responsibility to provide the electrical contractor with a soils report- to the depth required for the footing- so that the structural engineer can design the footing to meet the design guidelines outlined above.

1.06 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 and NFPA 101.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.
- C. Provide products with specified ingress protection (IP) ratings where required.
- D. Provide products with specified impact resistance (IK) ratings where required.
- E. Provide poles with shaft size and thickness to account for current AASHTO wind map ratings for the project location. Coordinate with manufacturer's EPA rating for all devices attached to pole.
- F. Products with Light Emitting Diodes:
 - Fixtures shall comply with LM-79-08: Electrical and Photometric Measurements of Solid-State Lighting Products.
 - 2. Exterior fixture diode arrays shall maintain +/- 500 K color temperature range through the life of the fixture and utilize 80+ CRI sources.
 - 3. Diode arrays shall be wired so that if one diode fails, at least 90% of the remaining diodes will operate.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle solid wood poles in accordance with ANSI O5.1.
- B. Protect luminaire finishes, lenses and trims from damage during storage and installation. Do not remove protective films until construction cleanup within each area is complete.
- C. Protective materials on poles while in storage shall not result in any permanent marks on the paint finish of the poles. Manufacturer shall fully instruct contractor as to required storage and acceptable temperature extremes for the packing materials.
- D. All metal poles shall be fully protected from moisture and corrosion prior to installation. Touch up paint in the field will not be accepted.

1.08 COORDINATION

A. Furnish bolt templates and pole mounting accessories to installer of pole foundations prior to pole ship date.

B. Contractor shall review site conditions and geotechnical reports prior to installing any pole footings. Alert design team if poor soil conditions or subgrade obstructions are encountered during installation.

PART 2 PRODUCTS

2.01 LUMINAIRES AND ACCESSORIES

- See schedule on drawings.
- B. No fiberglass poles will be permitted.
- C. Listed for wet or damp location as scheduled.
- D. Meet required and listed IP ratings.
- E. Provide low temperature (-20deg F) ballasts or LED drivers.

2.02 LIGHT EMITTING DIODES (LEDS):

- A. Manufacturers
 - 1. Nichia
 - 2. Lumileds
 - 3. Cree
 - 4. Samsung
 - 5. Citizen
 - 6. Engineer approved equals.
- B. Light Emitting Diodes shall be provided with a driver as a modular replaceable system. The system shall be fully designed and tested for operation throughout warranted period.
- C. Diode arrays shall maintain +/-100K color temperature through the life of the fixture.
- D. Diodes shall have a minimum color rendering index of 82.
- Diodes shall be photometrically tested for compliance with IESNA LM-80-08, with projections calculated in accordance with IESNA TM-21-11.
- F. Diode arrays shall maintain 70% lumen output through an average operating life of 50,000 hours.
- G. Diodes and associated printed circuit boards shall be RoHS compliant.
- H. Refer to Lighting Fixture Schedule for color temperature requirements.

PART 3 EXECUTION

3.01 FINISHES

- A. Pole shafts shall be satin ground, chemically etched, sanded or shot blasted to ensure proper powder coat surface adhesion. To ensure that the prepared parts are kept clean and not exposed to dirt, dust, grease or oil and to ensure maximum powder coat adhesion, the product shall proceed continuously and immediately to the powder coating process within the same facility where the poles and arms are manufactured.
- B. Powder coating material shall be a thermosetting polyester powder. A minimum coating thickness of 3.0 mils shall be maintained for aluminum and steel poles.
- C. Steel poles shall receive an additional internal rust inhibitor prior to receiving the final finish coat (required when 5-year warranty is specified).
- D. The powder coating system shall employ a powder recovery system utilizing closed loop quick-change technology to achieve efficient and contamination free color changes. The powder shall be applied only when both the ambient and part temperatures are 50 degrees F. or above. Once powder coated, the product shall proceed through a curing oven operating at 400 degrees Fahrenheit that has been surveyed and certified for temperature uniformity. The product shall move continuously through the oven from beginning to end and shall attain the appropriate time at temperature to cure the finish in accordance with the paint manufacturer's recommendations. Once oven cured, the product shall move immediately to and continuously through a forced air cooling tunnel designed to restore the product to acceptable packaging temperature prior to

inspection and packaging. Upon exiting the cooling tunnel the product shall be immediately inspected and packaged.

3.02 INSTALLATION

- A. Provide concrete bases for lighting poles at locations indicated.
- B. Install poles plumb and provide double nuts to adjust plumb. Grout around each base.
- C. Install lamps in each luminaire.
- D. Bond luminaires metal accessories and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.
- E. Grout between pole and concrete base. Grout color to match pole base.
- F. Refer to specification section 26 0923 for lighting controls requirements.
- G. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

3.03 WARRANTIES

- A. Light Fixtures
 - Light fixture manufacturer shall warranty LED array, and all associated components for a
 period of 5-years from date of shipment which shall include full replacement of any failed
 components. Labor shall be reimbursed to the contractor on a pro-rated basis.

B. Poles

- 1. Steel poles shall be warrantied to be free of defects in material and workmanship for a period of one (1) year from the date of shipment.
- 2. Aluminum poles shall carry a lifetime warranty to be free of defects in material and workmanship and free from corrosion.

C. Paint Finishes

- 1. Factory applied powder coated finishes shall be warranted against cracking, peeling or excessive fading due to normal climatic exposure for a period of five (5) years from the date of shipment. Damage to the finish coating caused by mechanical abuse, such as rough handling during installation or vandalism, is not covered by these warranties.
- D. All warranties shall remain as an agreement between the installing contractor and the manufacturer. No third parties shall be involved with warranty repairs or replacements of installed products without the written consent of the installing contractor and the owner or their representative.
- E. Labor for warranty repairs shall be billed by the contractor directly to the manufacturer or distributor during the duration of the labor warranty on the originally installed products. Labor work required on warrantied parts, but outside of the 1-year labor warranty shall be the responsibility of the owner.

3.04 ADJUSTING AND CLEANING

- A. Clean lighting fixtures of dirt and debris upon completion of installation.
- B. Clean all electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosure.
- D. Clean photometric control surfaces as recommended by manufacturer.
- E. Clean finishes and touch up damage.
- F. Any adjustment to aiming of the light fixtures in the field shall be completed in the presence of the lighting designer, contractor and architect.
- G. Lighting Designer and Contractor shall come to a mutual agreement on a specific date and time- after sunset, at which all of the fixtures can be aimed. All materials and labor necessary for the final aiming and adjusting of these fixtures shall be included in the Contractor's base bid and shall not warrant a change order or additional expense to the owner.

3.05 EXTRA PRODUCTS

- A. DRIVERS The electrical contractor shall include in their bid, two (2) additional drivers for all wattages, voltages and configurations required on the project.
 - 1. Extra materials shall be turned over to the owner at substantial completion in their original unopened packaging.
 - 2. All drivers shall be clearly marked for the fixture types that they are compatible with based on the drawings, fixture schedule and submittals received.
 - 3. Extra drivers included in this requirement shall not be used for warranty replacements without replacing this extra stock in the owner's inventory.
 - 4. No labor should be added to the project over the standard warranties already required in previous sections.
- B. LED BOARDS The electrical contractor shall include in their bid, two (2) additional LED boards for all wattages, lumen packages, distributions, voltages and configurations required on the project.
 - 1. Extra materials shall be turned over to the owner at substantial completion in their original unopened packaging.
 - 2. All LED boards shall be clearly marked for the fixture types that they are compatible with based on the drawings, fixture schedule and submittals received.
 - 3. All LED boards shall be provided with quick connects compatible with the drivers installed in the specified products.
 - 4. LED boards shall carry the same UL ratings as the installed products.
 - 5. Extra LED boards included in this requirement shall not be used for warranty replacements without replacing this extra stock in the owner's inventory.
 - 6. No labor should be added to the project over the standard warranties already required in previous sections.

SECTION 270050

BASIC COMMUNICATIONS REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Communications Requirements specifically applicable to Electrical Division Specification Sections.
- B. Division 27 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

1.02 WORK BY OWNER

- A. Owner's Responsibility:
 - Arrange for and deliver owner reviewed shop drawings, product data and samples to contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective or deficient items.
- B. Contractor's Responsibility:
 - 1. Review owner reviewed shop drawings, product data and samples.
 - 2. Review and unload owner purchased materials at site, inspect for completeness and/or damage jointly with the owner.
 - 3. Handle, store, install and finish products. Install electrical wiring and devices.
 - 4. Repair and/or replace items damaged after receipt.

1.03 OWNER OCCUPANCY

- A. The owner will occupy the premises during the construction period.
- B. Limit use of site and premises to allow owner occupancy.
- C. Cooperate with the owner to minimize conflict and to facilitate owner's operations.
- D. Schedule the work to accommodate this requirement.

1.04 REGULATORY REQUIREMENTS

- A. This contractor shall give proper authorities all requisite notices relating to work in his charge, obtain official permits, licenses for temporary construction and pay proper fees for it.
- B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by himself, by his employees or through any operation under his charge, whether in the contract or extra work.
- C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.
- D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.
- E. All work shall comply with the applicable recommendations of:
 - 1. The National Board of Fire Underwriters
 - The ANSI-NFPA 70 National Electrical Code
 - 3. The National Fire Protection Association (NFPA)
 - 4. The Occupations Safety and Health Act (OSHA)
 - 5. IBC Building Code (current) and any current applicable city building and or electrical codes.
 - 6. Fire Protection: Conform to International Fire Code (IFC) and NFPA.
 - 7. International Energy Conservation Code (IECC)

- 8. ANSI/NFPA 70 National Electrical Code.
- F. Obtain permits and request inspections from authority having jurisdiction.
- G. Conform to latest approved versions of codes.

1.05 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on drawings unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.
- C. This contractor shall, before submitting his bid, visit the site of the project to familiarize himself with locations and conditions affecting his work.
- D. It is the intent of this specification that the contractor furnishes all labor and material required to complete the installation as outlined in the drawings and specifications. No additions to the contract price shall be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.
- E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing wiring conduits, electrical panels, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.
- F. This contractor shall provide holes as necessary for the installation of his work and in accordance with materials other than the structure.

1.06 SEQUENCING AND SCHEDULING

- A. This contractor shall arrange his work in order that it progresses along with the general construction of the building.
- B. This contractor shall be kept informed as to the work of other trades engaged in this project and shall execute his work in such a manner so as not to delay or interfere with progress of other contractors
- C. Where space for electrical lines and conduit is limited, it is imperative that all such trades coordinate their work so as to insure concealment in space provided. Where conflict exists, the engineer shall decide priority of space. If work is not properly coordinated, the engineer may require removal and relocation of work without additional compensation.

1.07 GUARANTEE

- A. This contractor shall guarantee all of the apparatus, materials, equipment furnished and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.
- B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.
- C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at his own expense.

1.08 ENGINEER APPROVED EQUAL PRODUCTS

- A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.
- B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.

- C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".
- D. Similar products shall be all of the same manufacturers and style. There is no exception to this unless prior approval has been granted from engineer.

1.09 OWNER'S RIGHT OF SALVAGE

- A. Before beginning construction, the contractor shall check and verify with the owner each item of existing equipment that must be removed.
- B. The owner will designate which items of material or equipment not reused that he may wish to keep. The contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.
- C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for his use shall become the property of the contractor and shall be removed from the site.

1.10 TELECOMMUNICATIONS UTILITY COMPANY

A. The contractor is required to assist in coordination of final telecommunications utility locations that will serve the building with telephone, internet and cable television services. See 26 0050 for additional information.

1.11 PROTECTION AND MAINTENANCE

- A. The work covered by these drawings and specifications involves all work in the [new] [existing] building.
- B. Where necessary to connect to any existing utility service, this electrical contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.
- C. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.
- D. This contractor shall protect existing equipment in finished areas from dirt, dust, and damage as a result of his work.
- E. Coordinate protection requirements with department heads before beginning construction.
- F. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.12 DEMOLITION

- A. This contractor shall be responsible for the demolition and removal of all existing system elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be reused".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
 - 4. All elements to be removed are subject to the Owner's Right of Salvage.
- B. Preserve services to the existing facility. Extend/reroute/reconnect the existing systems as required providing for the continued function of these systems.

1.13 CUTTING AND PATCHING

- A. This contractor shall do all cutting and patching necessary for the installation of his work in all existing and new buildings unless otherwise noted.
- B. In areas where the integrity of new or existing fire separation assembly/wall is compromised by the work, this contractor shall be responsible to patch and/or seal openings as necessary to maintain and/or return fire separation to rating as required by applicable codes.

C. This contractor shall do all cutting and patching required for his work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.14 CLEANING AND RUBBISH

- A. This contractor, upon completion of his work, shall remove all rubbish and debris resulting from his operation and shall remove it from site at his own expense.
- B. As far as his work is concerned, all equipment shall be cleaned and the premises left in first class condition.
- C. This contractor shall maintain the work area each day to prevent hazardous accumulation of waste from his work.

1.15 SEALING AND PENETRATION

- A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.
- B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.
- C. Manufacturer offering products to comply with the requirements include the following:
 - 1. Dow Corning "Silicone RTV Foam"
 - 2. 3-M Corporation "Fire Barrier Caulk and Putty"
 - 3. Specified Technologies "EZ-Path"
- D. Installation of these products are to be in strict accordance with the manufacturer's recommendations.
- E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.16 HAZARDOUS MATERIALS

- A. If the contractor stores any hazardous solvents or other materials on the site, he shall obtain copies of the safety data sheets for the materials and post them at the site. He shall inform the owner and all employed of any potential exposure to this material.
- B. At no time shall any product containing asbestos be incorporated into the work.
 - 1. If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.17 AS-BUILT DRAWINGS

- A. This contractor shall provide (at the conclusion of the project) one clean, non-torn, neat and legible "as-built" set of drawings to the owner. These drawings shall show the routing of conduit, wiring and equipment drawn in at scaled locations. All circuits shall be labeled and shall conform to labeled panel breakers. All dimensions indicated shall be referenced to a column line. A set of construction blue prints will be furnished for this work.
- B. All system head-end equipment and devices shall be shown on the "as-built" drawings.
- C. Refer to Architectural Specification Sections for additional requirements.
- D. This contractor shall update these drawings during the project at least every week.

1.18 ALTERNATES

A. Refer to description of alternate bids under Architectural Specification Sections.

1.19 REVIEW OF MATERIALS

A. This contractor shall submit to the engineer, for review one (1) electronic copy giving a complete list of materials, fixtures, devices and panels he proposes to furnish. The brochure shall contain complete information as to the make of equipment, type, size, capacities, dimensions, and illustration. One of the returned copies shall be kept on the job at all times.

- B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and specifications unless he notifies engineer, in writing, of such deviation at time such drawings are furnished.
- C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.
- D. This contractor shall mark the date and sign each set. This indicates that each of them have been checked in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted, or checked and will be marked "resubmit" and sent back to the electrical contractor.

1.20 TEST OF SYSTEMS

- A. This contractor, before concealed, shall test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.
- B. This contractor shall coordinate all testing of systems within Division 27 specification section. Follow manufacturer's recommended testing procedures as a minimum unless the following related specification section has further detail of testing procedures. The more stringent testing procedure shall be used.

1.21 SCOPE OF WORK

- A. This contractor shall furnish all the labor and material necessary to install a complete electrical system for the remodeled building.
- B. This contractor shall furnish all the labor and material to install a complete communication system in the new building. The system shall include all items of work as outlined in these specifications and on the drawings.
- C. All work shall be performed by a well-qualified, licensed or certified technician with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that his technicians are familiar with all the various codes, installation procedures and tests applicable to this work.
- D. All equipment shall be new and of the type specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.
- E. The intent of the specifications and drawings is for complete installation of the systems outlined in the specifications and drawings so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation. The specifications and drawings cannot deal individually with the many minute items that may be eventually required by the nature of the systems.
- F. This contractor is required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type.
- G. This contractor, shall before proceeding with any work, review the architectural drawings and specifications. Any conflict between the electrical and architectural drawings and specifications shall be reported to the engineer for clarification.
- H. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer's attention and an addendum is issued for clarification.
- I. The cable that is installed without using raceway shall be neatly routed and supported every three foot (3') by j-hooks. All wiring in mechanical rooms shall be in conduit. All exposed wiring shall be in raceway. No cable shall be allowed to lie on the accessible ceiling tile.

- J. The Fire Suppression Contractor shall establish system elevations prior to fabrication and installation. The Fire Suppression Contractor shall coordinate elevations with other trades. All elevations shall be coordinated with all trades in the field prior to installation. When a conflict between trades arises, the design team shall be notified immediately prior to further installation however priority shall be as follows:
 - Lighting Fixtures
 - 2. Gravity flow piping, including steam and condensate.
 - 3. Electrical bus duct.
 - Sheet metal.
 - 5. Cable trays, including access space.
 - 6. Other piping.
 - 7. Conduits and wireway.

1.22 DAILY HOUSEKEEPING AND CLEANING

- A. At the end of each workday, the contractor shall remove all of his debris, rubbish, tools, and surplus materials from the project work area. The work area shall be broom cleaned and left in a neat and orderly condition. The contractor, for the removal of debris from the project, shall not use the owner's waste disposal facility.
- B. At end of construction, all equipment shall be cleaned and the premises left in first class condition as far as this contractor's work is concerned.

1.23 WALL CONTINUITY (1 HR.)

- A. All items mounted in 1 hr. rated walls requiring an opening larger than a four inch (4") square (16 sq. inches) require the 1 hr. rating not be degraded.
- B. Any system panels in a 1 hr. wall will require the exterior of the recessed panel be covered with 5/8 inch fire rated gypsum board. This is true for any device requiring more than a 16 sq. inch opening.

1.24 LOW VOLTAGE CABLE INSTALLATION

A. This contractor is to install if they are licensed to, or contract with a licensed electrician to install conduit serving low voltage cables located in all mechanical rooms and non-accessible areas and exposed structural areas. Use cable trays in other areas as indicated on the drawings. Where cable trays are not accessible, use J-hooks equal to Caddy Cable CAT. Provide hooks with closure holes and cable ties. Mount hooks 32 inch on center.

1.25 DIGITAL MEDIA AGREEMENT

- A. Computer Aided Drafting (CAD) documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.
- B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

1.26 SYSTEM CONFIGURATION AND PROGRAMMING FILES

- A. Supply system configuration and programming files where export is available.
- B. Supply uncompiled programming for systems applicable.
- C. All configuration and programming shall be property of the owner at conclusion of the project.

PART 2 PRODUCTS

NOT USED PART 3 EXECUTION

NOT USED

SECTION 270080 COMMUNICATION SCHEDULE OF VALUES

PART 1 GENERAL

1.01 FORM COMPLETION

- A. The successful Communications Contractor shall complete this form in its entirety within 30 days of receipt of signed contract from the General Contractor, and submit directly to MODUS.
- B. This information is confidential and will not be disclosed to any individual outside of MODUS. Data collected will be used in evaluating pay applications.

1.02 OVERALL CONTRACT

Base Communication Bid	\$	
Add or deduct accepted alternates, negotiated changes, or other modifications to the contract Total Communication Bid	\$ \$	
1.03 SCHEDULE OF VALUES		
Telecommunication Cabling Infrastructure - Material and Labor	\$	
Data Communications Network Equipment - Material and Labor	\$	
Total Communication Bid (Sum of Schedule of Values)	\$	

PART 2 PRODUCTS
NOT USED
PART 3 EXECUTION
NOT USED

SECTION 270090

MINOR COMMUNICATION DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements of the Contract Forms, the Conditions of the Contract, Division 1 - General Requirements and Specification Section 26 0050 - Basic Electrical Requirements "General Provisions" apply to this section.

1.02 SCOPE

- A. This contractor shall be responsible for the demolition and removal of all existing communication elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be relocated".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
- B. Preserve services to the existing facility. Extend, reroute, and reconnect existing systems as required providing for the continued function of these systems.
- C. Demolition shall be accomplished by the proper tools and equipment for the work to be removed. Personnel shall be experienced and qualified in the type of work to be performed.
- D. This contractor shall remove all abandoned equipment, cabling and boxes associated with the remodeled area unless noted otherwise.
- E. This contractor is responsible for providing communication cabling protection for all existing systems to remain during this project.

1.03 MATERIALS

- A. All elements to be removed are subject to the Owner's Right of Salvage.
- B. All materials removed shall be the property of the removing contractor and shall be removed from the site by him, unless otherwise specified.
- C. The owner may designate and have salvage rights to any material herein demolished by this contractor. It will be the owner's responsibility to designate such salvageable items and remove them prior to the contractor working in that area.

1.04 EXISTING CONDITIONS

- A. Demolition plans are based on casual field observations and existing record documents. Report discrepancies to the owner before disturbing existing installation. Beginning of demolition means installer accepts existing conditions.
- B. If any existing equipment, cabling or devices that are to remain are disturbed by operations under this contract, this contractor is required to re-establish continuity of such systems according to owner approved standards and methods.
- C. This contractor shall arrange for the general contractor to repair and patch all construction with material necessary to match surrounding due to removal of equipment and conduit.
- D. This contractor shall furnish all required labor and material for extension of existing systems.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Beginning of demolition means installer accepts existing conditions.
- B. Verify existing structured cabling, special systems wiring topology, and reconnect as necessary.
- C. Verify that abandoned cabling being removed is disconnected from the source and is not actively serving other areas of the existing building. Reconnect as required to prevent any system downtime.

D. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to the owner before disturbing existing installation.

3.02 PREPARATION

- A. Disconnect structured cabling and special systems components in walls, floors, and ceilings scheduled for removal. Disconnect circuits at the source.
- Coordinate any service outage with all of the owner's existing telecommunications service providers.
- C. Existing Communication Network: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchover connections. Obtain permission from the owner, at least 48 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections as required.
- D. Existing Telephone System: Maintain existing system in service.
- E. Maintain all existing communication lines to the building fire alarm system, elevators and intrusion system.

3.03 DEMOLITION AND EXTENSION OF EXISTING COMMUNICATIONS WORK

- A. Demolish and extend existing communications work under provisions of this section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- Remove abandoned wiring to source of supply.
- D. Disconnect abandoned cable and remove devices. Provide a blank cover for abandoned devices that have not been removed.
- E. Disconnect and remove abandoned patch panels, cross connect fields and special systems distribution equipment.
- F. Disconnect and remove devices and equipment serving abandoned special systems.
- G. Repair adjacent construction and finishes damaged during demolition and extension work.
- H. Extend existing installation using materials and methods compatible with existing communications installations or as specified.

3.04 CLEANING AND REPAIR

A. Clean and repair existing materials that remain or are to be reused.

3.05 INSTALLATION

A. Install relocated materials and equipment.

SECTION 270526

GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding clamps
- B. Splice
- C. Grounding lugs
- D. Communications grounding rods
- E. Telecommunications bonding backbone

1.02 RELATED SECTIONS

- A. Specification Section 26 0526 Grounding and Bonding for Electrical System
- B. Specification Section 27 0528 Pathways for Communication Systems
- C. Specification Section 27 1005 Telecommunications Cabling Infrastructure

1.03 REFERENCES

- A. ANSI/NFPA-70 2014 National Electrical Code (NEC)
- B. ANSI/IEEE Std. 1100-2005 Recommended Practice for Powering and Grounding Electronic Equipment
- C. TIA-607-B Telecommunications Grounding (Earthing) and Bonding for Customer Premises
- D. ANSI/TIA-606-B Administration Standard for Telecommunications Infrastructure
- E. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings

1.04 SUMMARY

- A. Provide a communications bonding and grounding system as described within this specification and drawings. System shall be in compliance with the above cited Codes, Standards and Agencies.
- B. Comply with the requirement for Section 26 0526 Grounding and Bonding for Electrical System.
- C. Bond the following items within the telecommunications grounding system:
 - 1. All communications system active equipment.
 - 2. All PDU and surge protection equipment.
 - 3. Raised floor systems.
 - 4. Underfloor grounding grids for computer or telecommunications rooms.
 - 5. Metallic raceway systems, including metallic cable trays.
 - 6. Communications equipment enclosures (cabinets) or cross-connect frames.
 - 7. Broadband passive devices.
 - 8. Metallic splice cases.
 - 9. Metallic cable screens, armor or shields.
 - 10. All metal cable conduit.
 - 11. Electrical service panels in entrance facilities, telecommunications and equipment rooms.
 - 12. Wall and rack mounted grounding busbars.
 - 13. Exposed building steel that is within 6 feet of equipment racking systems.
 - 14. Building steel extending to earth in outside-plant.
 - 15. All related bonding accessories.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.

- 2. Grounding to conform to applicable building codes.
- 3. Methods of construction that are not specifically described or indicated in the contract documents to be subject to the control and approval of the owner or their official representatives.
- 4. Equipment and materials specified shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed.
- 5. Where "approved equal" is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to written approval by the owner per the substitution policy listed within these specifications.
- 6. Materials and methods shall comply in every way with above cited Standards and Codes.

1.06 SUBMITTALS

- A. Shop drawings shall be submitted showing construction details and locations of components, and description and routing of interconnecting cabling.
- B. Manufacturer's data on all products, including but not limited to:
 - 1. Catalog cut sheets.
 - 2. Roughing in diagrams.
 - 3. Installation instructions.
 - 4. Typical wiring diagrams and risers.
 - 5. Drawings showing device locations.

1.07 REGULATORY REQUIREMENTS

A. Conform to applicable building code for requirements applicable to work specified herein.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Deliver items in their original factory shipping cartons.
- B. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.

1.09 APPROVED MANUFACTURERS

- A. Panduit
- B. Chatsworth Products, Inc.
- C. Hoffman
- D. Engineer Approved Equal

PART 2 PRODUCTS

2.01 GROUNDING CLAMPS

- A. Pipe Clamps:
 - 1. Used to ground copper code conductor to water pipe or copper tubing.
 - 2. Cast from high strength, electrolytic bronze to provide reliable grounding connections.
 - 3. Plated steel screws provide high strength and inhibit corrosion.
 - 4. Accommodates a wide range of pipe, tube, rod and conductor sizes.
 - 5. UL 467 Listed for grounding and bonding with AWG conductor.
- B. Bronze Grounding Clamps for Conduit:
 - 1. Used to ground copper code conductor parallel to, or at a right angle to a rod, tube, or pipe.
 - 2. Made from high strength, electrolytic cast bronze.
 - 3. Accommodates a wide range of pipe, tube, rod and conductor sizes.
 - 4. UL 467 Listed for grounding and bonding with AWG conductor and suitable for direct burial in earth or concrete.
- C. Bronze Grounding Clamps with Lay-in Feature:
 - 1. Bonds water pipe to continuous copper grounding conductors.
 - 2. Made from high strength, electrolytic cast bronze.

- 3. Bronze hardware provides long term reliable assembly.
- 4. UL 467 Listed for grounding and bonding with AWG conductor and suitable for direct burial in earth or concrete.

D. Zinc Ground Clamp:

- 1. Bonds steel and aluminum pipe to aluminum conductors.
- Made from die cast zinc.
- 3. Zinc plated steel hardware.
- 4. UL 467 Listed for grounding and bonding.

E. Access Floor Grounding Clamps:

- Bonds crossed grid conductors to each other, and bonds the access floor pedestals to the conductors.
- Specifically designed to bond perpendicular Mesh-BN conductors per TIA-942-A and TIA-607-B.
- 3. Bonds to the pedestal with a single bolt to simplify installation.
- 4. Accommodates conductor sizes from #6 to 1/0 AWG.
- 5. Bonds both round and square access floor pedestals for greater flexibility.
- 6. Crossing grounding conductors affixed and bonded using a split bolt quad clamp which requires only one nut to install.
- 7. Split bolt design allows easy insertion of perpendicular conductors speeding installation and is UL 467 Listed.
- 8. Each clamp accepts up to two conductors for a high performance bond with faster installation.
- 9. Split-bolt made from high strength, electrolytic bronze to provide reliable grounding connections.

F. Universal Beam Grounding Clamp:

- 1. For bonding structural steel such as I-Beams into bonding network.
- 2. Universal, fits on a wide range of standard (angled) and wide flange (parallel) structural steel beams.
- 3. Provide a mounting pad suitable for a two-whole compression lug.
- 4. Installs quickly and easily with standard ½" key hex wrench tooling.
- 5. UL 467 Listed and CSA 22.2 Certified for grounding and bonding suitable for direct burial in earth or concrete.
- 6. Comply with vibration tests per MIL-STD-202G.

2.02 SPLICE

- A. Compression-type Aluminum-to-Copper Reducing Splice:
 - 1. Dual rated for use with aluminum or copper conductors.
 - 2. Factory pre-filled with joint compound and sealed with easy pull-out end plug to inhibit corrosion.
 - Color-coded end plug and die index numbers marked on barrel for proper crimp die selection.
 - 4. Tin-plated to inhibit corrosion.
 - 5. For use up to 35KV and temperature rated 90 degree C when crimped with manufacturer rated crimping tools and dies.

B. Code/Flex Conductor H-TAPs:

- 1. Used as a splice, or to tap smaller conductors into larger continuous conductors.
- 2. Each HTAP terminates a wide range of conductor sizes and combinations of code and flex conductors Class G, H, and I to suit a variety of applications.
- 3. Tap grooves are separated from one another, allowing them to function independently so HTAP can be used with single or multiple conductors, providing maximum design and installation flexibility.
- 4. Color coded and marked with manufacturer die index numbers for proper crimp die selection.

- 5. UL Listed and CSA Certified, with wide size range of conductor sizes and rated for applications up to 600V when crimped with manufacturer rated tools and dies.
- 6. Tin plated to inhibit corrosion.
- C. Code Conductor, Thin Wall, Tin -plated C-TAP:
 - 1. For copper-to-copper splicing or pigtail tap splicing.
 - 2. Wide wire range-taking capability minimizes inventory requirements.
 - 3. Color-coded for proper crimp die selection.
 - 4. Ribbed design provides high strength.
 - 5. Made from high conductivity wrought copper.
 - 6. Tin-plated to inhibit corrosion and oxidation.
 - 7. UL Listed and CSA Certified, with wide size range of conductor sizes and rated for applications up to 600V when crimped with manufacturer rated tools and dies.

2.03 GROUNDING LUGS

- A. Copper and Aluminum One-Hole Grounding Lay-in Lug for Bonding Ladder Rack:
 - 1. Used for quick installation of a continuous grounding conductor.
 - 2. UL 467 Listed for grounding and bonding, copper lugs. UL Listed for direct burial in earth or concrete
 - 3. UL 467 Listed for use up to 600V and temperature rated 90 degree C.
- B. Two-hole, Long-barrel Copper Compression Lugs for Grounding Conductors:
 - 1. Meets TIA-607-B requirements for network systems grounding applications.
 - 2. Tested by Telcordia meets NEBS Level 3 with AWG conductor.
 - 3. For use up to 35KV and temperature rated 90 degree C when crimped with manufacturer rated crimping tools and dies.
 - 4. Color-coded barrels marked with manufacturer's die index numbers for proper crimp die selection.
 - 5. Have long barrel to maximize number of crimps and provides premium wire pull-out strength and electrical performance.
 - 6. Have "inspection window" over tongue to visually assure full conductor insertion.
 - 7. Be tin-plated to inhibit corrosion.
 - 8. Available with NEMA and BISCI hole-sizes and spacing.

2.04 COMMUNICATIONS GROUNDING RODS

- A. Standard Grounding Rod:
 - 1. Material: Copper-clad steel.
 - 2. Size: 3/4 -inch by 8 feet long.
 - 3. Standards: Meet requirements of ANSI/UL 467-1984, CSA and ANSI/NEMA GR-1.
 - a. Used for guick installation of a continuous grounding conductor.
 - b. UL 467 Listed for grounding and bonding, copper lugs. UL Listed for direct burial in earth or concrete.
 - c. UL 467 Listed for use up to 600V and temperature rated 90 degree C.
- B. Electrolytic Grounding Rod:
 - Where standard ground rods do not have acceptable levels of conductivity (typically greater than 5 ohms resistance) to earth due to local soil conditions, electrolytic systems may be considered.
 - 2. Such systems shall meet the following:
 - a. Be comprised of a hollow stainless steel or copper tube 10 feet or longer and filled with a mixture of hygroscopic electrolytic salts.
 - b. Function as an active grounding system by absorbing moisture out of the air and constantly leaching an electrolytic solution into the surrounding soil to maintain high conductivity.
 - c. Rod shall be encased in a conductive, non-corrosive carbon based back fill material.
 - d. Provide low resistance to ground.
 - e. Provide season to season stability.

- f. Be maintenance-free for 30 years.
- g. Contain no hazardous materials or chemicals.

2.05 TELECOMMUNICATIONS BONDING BACKBONE (TBB) GROUNDING CONDUCTORS

- A. To be bare or insulated copper, of minimum conductor size #6 AWG and sized at 2 kcmil per linear foot up to a maximum of 750 kcmil. For details on TBB sizing see "Execution" section at end of this document.
- B. Where un-insulated, to be identified with green tape at termination location.
- C. Labeled in accordance with recommendations set forth in ANSI/TIA-606-B Administration for Telecommunications Infrastructure.

PART 3 EXECUTION

3.01 GENERAL

- A. It shall be the responsibility of this contractor to adapt the following general guidelines and principles for the requirements of the actual environments where the grounding and bonding systems are to be implemented..
- B. System shall provide equipment ground connections (bonds) from the premises entrance facility and outside-plant earthing system to each telecommunication room ground busbar, through the racking systems to bond the network equipment.
- C. Entire grounding link from equipment to earth should be visually verifiable except where hidden by walls, conduit or pathways.
- D. Installing contractor shall label all elements of the communications bonding network according to guidelines defined in TIA-607-B and ANSI/TIA 606-B.
- E. It is the responsibility of the installer to be knowledgeable of all previously cited Standards and Codes and to bring to the attention of the engineer any conflicts discrepancies to achieve a fully functioning, standards-compliant earthing system.

3.02 TELECOMMUNICATIONS BONDING BACKBONE (TBB)

- A. Bonding and grounding conductors may be insulated or un-insulated and shall not decrease in size as the grounding path moves closer to earth.
- B. Connections (bonds) between the telecommunications grounding network and associated electrical panels shall be done by a qualified electrician in accordance with guidelines in TIA 607-B and applicable electrical codes.
- C. Bonding Conductors should be continuous and routed in the shortest possible straight line path, avoiding changes in elevation and sharp bends.
- D. TBB conductors shall be protected from mechanical damage and built so as to minimize splicing. Where splicing is unavoidable they shall be done using irreversible compression splices (C-TAPS) built to that purpose. See the Materials section of this document for appropriate compression splices.
- E. TBB in multi-story buildings with multiple risers shall employ a grounding equalizer (GE) between vertical grounding backbones at the top floor of the building and minimally at every third floor in between to the lowest floor level. The GE shall be no smaller than the largest sized TBB.
- F. Routing grounding conductors through ferrous metal conduit should be avoided, but if it is necessary due to building constraints, any grounding conductor running through ferrous conduit longer than 3 feet shall be bonded at the end using appropriately sized HTAP.
- G. Conductors used to bond TBB to conduit ends shall be of #6 AWG size or larger.
- H. Provide appropriately sized TBB conductor using the pathway distances and the chart found in TIA 607-B.

3.03 BONDING WITHIN RACKS AND CABINETS

- A. Racks and cabinets shall be bonded into the communications bonding network with conductors of #6 AWG or larger.
- B. Depending on size of the telecommunications room, rack bonding conductors (RBC) may tap into underfloor or overhead grounding conductors, or for smaller TRs (3-5 racks or cabinets), may go directly from the rack to the wall mounted busbar.
- C. Racks, cabinets and similar enclosures shall not be attached serially but must have individual RBC into the grounding system.
- D. Newly installed racks and cabinets shall have vertical grounding busbars installed along one rail to provide clean bonding landing point for all rack mounted equipment. Grounding busbars shall not be isolated from the rack or cabinet.
- E. All painted components of racks/cabinets shall be assembled using serrated grounding washers and thread-forming screws to ensure electrical continuity between the different structural components of the rack/cabinet.
- F. Larger equipment with integral grounding terminals or pads shall be bonded to the vertical busbar with equipment grounding kits attached to those terminals and bonding them to the rack-mounted busbars.
- G. Anywhere two metallic surfaces are to be bonded, contractor shall clean the contact areas of paint or oxidation using abrasive pads, and apply film of anti-oxidation compound between surfaces prior to bonding.
- H. All cable fittings shall be of two-hole compression-type. Mechanical screw-lugs on racking systems will not be accepted and must be removed and replaced at contractor's expense.
- I. All screws used to affix compression lugs to rack-mounted vertical busbars shall be of the thread forming type made specifically for electrical bonding.
- J. Smaller equipment not having integral grounding pads must be bonded to the rack through the equipment mounting flanges using green thread-forming grounding screws with serrations under the head to cut through pain, coatings and oxidation that may be present on the equipment flange. Such equipment shall have minimally one grounding screw per piece of equipment.

3.04 FIELD QUALITY CONTROL

- A. On installations confined to a single telecommunications room, the installing contractor shall visually verify continuity of communications bonding system from equipment, through racking systems, to overhead underfloor backbone to the wall mounted busbar in that telecommunications room.
- B. Contractor shall further verify the use of all appropriate bonding accessories in the racking systems such as grounding washers and thread-forming grounding screws.
- C. Installation of a building-wide telecommunications backbone, installing contractor is further responsible for visually verifying sizing and sound installation of the telecommunications bonding backbone including presence of properly sized and installed grounding equalizer conductors between backbones contained in separate risers.
- D. Inspecting contractor shall verify that any conduit larger than 3 feet through which a grounding conductor passes is properly bonded to the grounding conductor as described in this document.
- E. During inspections contractor shall verify compliance with all stipulations specified in this document and compliance with all regulatory references cited.
- F. All openings or gaps in the bonding system during inspections will be recorded in the inspection report and remedied.

G. During inspections, contractor shall check all grounding and bonding system conductors and connections for tightness and proper installation, including checking proper dies were used on compression taps and fittings by checking embossed die numbers on those connections.

SECTION 270528

PATHWAYS FOR COMMUNICATION SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Telephone termination backboards

1.02 REFERENCES

- A. EIA/TIA-568B Commercial Building Wiring Standard
- B. EIA/TIA-569B Commercial Building Standard for Telecommunication Pathways and Spaces
- C. NFPA 70 National Electrical Code

1.03 SYSTEM DESCRIPTION

A. Pathway: Conform to EIA/TIA 569B, using raceway as indicated.

1.04 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.01 TELEPHONE TERMINATION BACKBOARDS

- A. Material: Plywood.
- B. Size: 4' x 8', 3/4 inch thick.
- C. Grade: Fire-retardant, AC grade with "C" grade applied to wall.
- D. Painted on all sides and edges with fire resistant paint.
- E. Apply at location as shown on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Support raceways, backboards and cabinets.
- B. Install termination backboards and cabinets plumb, and attach securely to building wall at each
- C. Install polyethylene pulling string in each empty conduit over ten feet (10') in length or containing a bend.
- D. This contractor shall provide blank cover plates for all indicated telephone and computer outlets.
- E. All conduit sizes shall be verified with the owner prior to installation.
- F. Provide 3/4 inch conduit with box from each outlet location to above nearest accessible ceiling.

SECTION 271005

TELECOMMUNICATIONS CABLING INFRASTRUCTURE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Multi-Dwelling Unit Enclosure
- B. Patch Panels
- C. Work Area Outlets
- D. Grounding and Bonding Products

1.02 SUMMARY

- A. Work included, but not limited to:
 - 1. Data network backbone cable installation.
 - 2. Data network horizontal cable installation.
 - 3. Data wiring closet setup.
 - 4. Infrastructure cabling management.
 - 5. Data patch cables.
 - 6. Ground and Bonding.
 - 7. Testing requirements.

1.03 GENERAL REQUIREMENTS

- A. The drawings and specifications indicate the intent and direction of the installation. Items and their location are shown diagrammatic and are to be field verified by the cabling contractor prior to completing work associated with the item.
- B. All cabling work shall be performed in strict accordance with all applicable laws, ordinances, codes of local, state and federal government, or other authorities having lawful jurisdiction. The cabling contractor is required to verify all requirements.
- C. The cabling contractor shall furnish all required labor, material, and associated tools to facilitate the installation of all the infrastructure cables and associated items specified herein and with respect to the infrastructure design drawings without damage to the cables, associated items, and/or facilities.
- Qualified personnel, utilizing state-of-the-art equipment and techniques shall complete all installation work.
- E. All cables routed outside of the cable runway installed shall be properly supported.
- F. All wall and/or floor penetrations shall be via metal conduit sleeves properly sized, supported and fire stopped.
- G. All materials shall be installed in accordance with the manufacturer's specified recommendations and practices.

1.04 QUALITY ASSURANCE

- A. Standards: All telecommunications wiring, cabling devices, and other associated items and work shall conform to the most recent requirements of the following codes, standards, and organizations where applicable:
 - 1. American National Standards Institute (ANSI)
 - 2. Electronic Industries Association (EIA)
 - 3. Federal Communications Commission (FCC)
 - 4. Institute of Electrical and Electronic Engineers (IEEE)
 - 5. International Organization for Standardization (ISO)
 - 6. National Electric Code (NEC)
 - 7. National Fire Protection Association (NFPA)
 - 8. BOCA National Building Code
 - 9. Underwriter's Laboratories (UL)
 - 10. Telecommunications Industry Association (TIA)

- 11. Building Industry Consulting Services International
- 12. Society of Cable Telecommunications Engineers (SCTE)
- B. The copper data infrastructure cable system shall have a manufacturer's material and labor performance certification for the installed cable and components. The certification shall be that UTP Category 6 cabling infrastructure will perform to TIA's specifications for that Category. A manufacturer's written certification document shall be submitted at the completion of the project.
- C. A matched solution shall be provided end-to-end for all cabling infrastructure. No third party components shall be provided unless otherwise noted elsewhere in the project specification or drawings.
- D. The installer must be able to provide a warranty to the owner. Duration of the warranty shall be a minimum of ten years from the date of project completion and acceptance. It shall cover all of the product as well as their performance for the warranty period.
- E. The cabling contractor shall be in business for a minimum of five (5) years.
- F. The contractor must be registered with BICSI and have at least one Registered Communications Distribution Designer (RCDD) on full-time staff or be approved by the project engineer during the bidding process. Prospective contractors shall seek written approval from project engineer no later than seven days prior to bidding. Include in request to project engineer a list of full-time staff with certifications and references to three projects of similar size and scope in previous two years.
- G. The contractor must possess current liability insurance certificates.
- H. Provide a complete and detailed test plan for the telecommunications cabling system including a complete list of test equipment for the components and accessories for each cable type specified, 30 days prior to the proposed test date. Include procedures for certification, validation, and testing.

1.05 SUBMITTALS

- A. The cabling contractor shall not begin any installation of materials that require a material fact sheet and/or sample to be submitted and approved by the project engineer. If material is installed prior to approval, the bidder is liable for the cost of removal and replacement if the material is not approved.
- B. The cabling is to provide material cut-sheet for all products (including cabling) listed in this specification, and any other material not listed but required for proper installation.
- C. Provide both the manufacturer's certification for all installers and technicians that will have a role in this project as well as all BICSI certifications as outlined in the sections above.

1.06 CLOSE-OUT AND FINAL ACCEPTANCE

- A. Operations and Maintenance Manuals
 - 1. Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance of products provided as a part of this project. Submit operations and maintenance data not later than 2 months prior to the date of occupancy.

B. Drawings and As-Builts

- 1. Provide drawings including documentation on cables and termination hardware in accordance with TIA/EIA-606. Drawings shall include schedules to show information for cut-overs and cable plant management, patch panel layouts and cover plate assignments, cross-connect information and connecting terminal layout as a minimum. Drawings shall be provided in hard copy format and on electronic media for project engineer's review and final delivery to owner. Provide the following drawing documentation as a minimum:
 - a. Cables A record of installed cable shall be provided in accordance with TIA/EIA-606. The cable records shall include only the required data fields in accordance with TIA/EIA-606. Include manufacture date of cable with submittal.
 - b. Termination Hardware A record of installed patch panels, cross-connect points, distribution frames, terminating block arrangements and type, and outlets shall be

- provided in accordance with TIA/EIA-606. Documentation shall include the required data fields only as a minimum in accordance with TIA/EIA-606.
- c. Working Red Line Drawings A hand completed set of drawings indicating the general cable routing of the backbone cables and the primary routes of the horizontal cables shall be provided. Also indicate all wall and floor sleeves utilized. The drawings for this information shall be a non-working, clean set of drawings.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. The cabling contractor shall coordinate all delivery, storage and handling concerns with the general contractor.
- B. Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for telecommunications cabling and equipment placed in storage.

1.08 APPROVED CABLING VENDORS

- A. All cabling and connectivity products provided by the structured cabling contractor shall be part of the following complete end-to-end systems:
 - 1. Panduit
 - 2. Belden
 - 3. Commscope
 - 4. BerkTek
 - 5. Engineer approved equal
- B. All components in the cabling channel shall be of the same manufacturer with performance that meets or exceeds the characteristics of the horizontal cabling.

1.09 JACKET TYPE

A. This project is planned to have all ducted returns on HVAC equipment. It shall be this contractor's responsibility to make final confirmation. Once confirmed, PVC jacketed cable shall be used. If there are any wild returns on this project, plenum rated cable shall be used.

1.10 COLORS

A. The owner shall determine all colors of cables, jack inserts, and other visible components during the submittal process from the standard colors available by each individual manufacturer. No custom colors will be used.

PART 2 PRODUCTS

2.01 MULTI-DWELLING UNIT ENCLOSURE

- A. Enclosure:
 - 1. Description: 30" structure media enclosure with vented hinged door.
 - Manufacturers:
 - a. Leviton (# 49605-30W basis of design)
 - b. Legrand
 - c. Suttle
 - d. Engineer approved equal.

B. Accessories:

- 1. Description: AC power surge protective module with one duplex receptacle. Leviton surge J-box kit wall plate #47605-ACS.
- 2. Description: Category 6; 6 port patch panel. Suttle Apparatus MXM-521 Media Max Gateway Term Mondule or Leviton #47605-C5B 6 port bracket.
- C. Description: 4 way video splitter. Leviton 1 x 4 passive TV splitter with bracket.

2.02 PATCH PANELS

- A. Data and Voice:
 - Modular 24 or 48 position, 19 inch rack, 1U or 2U, UTP angled patch panel. Panel to meet performance standards of horizontal cabling manufacturer. Patch panel bracket shall accept RJ45 modular jacks that are utilized at the work area outlet.

- a. Product shall be a matched solution from cabling manufacturer
- b. Quantity as needed for all connections in contractor plus 25% at each rack for future growth.

2.03 WORK AREA OUTLETS

- A. Work Area Data/Voice Jacks:
 - 1. Jacks shall be modular RJ-45 style and meet performance requirements of horizontal cabling.
 - a. Product shall be a matched solution from cabling manufacturer.
- B. Work Area Outlet Cover Plate:
 - Telecommunications cover plates shall comply with TIA-568-C.1 and shall be flush design constructed of high impact thermoplastic material and match the style and color of receptacles and switch cover plates. Provide any blank inserts as required for all unused openings.
 - a. Product shall be a matched solution from cabling manufacturer.
- C. Voice Wall-Mounted Outlet:
 - 1. Provide stainless steel phone faceplate with steel screw terminals and information outlet capable of RJ45 connection to normal phone.
 - a. Product shall be a matched solution from cabling manufacturer.

2.04 GROUNDING AND BONDING PRODUCTS

A. Provide in accordance with UL 467, TIA J-STD-607, and NFPA 70. Components shall be identified as required by TIA/EIA-606. Provide ground rods, bonding conductors, and grounding busbars as specified in specification section 26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

PART 3 EXECUTION

3.01 GENERAL

- A. The drawings and specifications are considered to reflect the intent and direction for a complete data cable system.
- B. Quantities shown are for general information and may be incorrect. The bidder is to verify all quantities and is to report any count differences to the engineer prior to submission of their installation response. The cabling contractor will be held responsible for all required quantities to complete the project to the intent and direction of the drawings and specifications.
- C. Material description and manufacturer's part numbers are shown. The cabling contractor is expected and has the responsibility to verify that the part number matches the description. Any discrepancy is to be noted to the engineer prior to response submittal. The cabling contractor is responsible for the correct materials being furnished and installed.
- D. Install telecommunications cabling and pathway systems, including the horizontal and backbone cable, pathway systems, telecommunications outlet/connector assemblies, and associated hardware in accordance with TIA-568-C.1, TIA-568-C.2, TIA-569, NFPA 70 and UL standards as applicable. Provide cabling in a star topology network. Pathways and outlet boxes shall be installed as specified in specification section 26. Install telecommunications cabling with copper media in accordance with the following criteria to avoid potential electromagnetic interference between power and telecommunications equipment. The interference ceiling shall not exceed 3.0 volts per meter measured over the usable bandwidth of the telecommunications cabling.
- E. Install UTP telecommunications cabling system as detailed in TIA-568-C.1. Screw terminals shall not be used except where specifically indicated on plans. Use an approved insulation displacement connection tool kit for copper cable terminations. Do not exceed manufacturers' cable pull tensions for copper and optical fiber cables. Provide a device to monitor cable pull tensions. Do not exceed 25 pounds pull tension for four pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples. For UTP cable, bend radii shall not be less than four times the cable diameter. Cables shall all be terminated. There shall be no cable with

unterminated elements. Cabling shall be continuous with no splices. Label cabling in accordance with paragraph titled LABELING.

3.02 HORIZONTAL CABLING

A. Install horizontal cabling as indicated on drawings. Do not untwist Category 6/6A UTP cables more than one half inch from the point of termination to maintain cable geometry. Provide slack cable in the form of a figure eight (not a service loop) on each end of the cable, 10 feet in the telecommunications room, and 12 inches in the work area outlet.

3.03 PATHWAYS

A. Provide in accordance with TIA-569 and NFPA 70. Provide building communications cabling pathway as specified in Section 26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.

3.04 WORK AREA OUTLETS

A. Terminate UTP cable in accordance with TIA-568-C, TIA-568-C.2 and wiring configuration as specified. All fiber optic cabling shall be terminated in accordance with TIA-568-C.3. Follow manufacturer's installation guidelines for all specific requirements related to work area outlet termination.

3.05 COVER PLATES

A. As a minimum, each outlet shall be labeled as to its function and a unique number to identify cable link in accordance with the section titled LABELING.

3.06 PULL CORDS

 Pull cords shall be installed in conduit serving telecommunications outlets that do not have cable installed.

3.07 PATCH PANELS

A. Patch panels shall be mounted in equipment racks with sufficient ports to accommodate the installed cable plant plus 25 percent spares. Copper entering a patch panel shall be secured to the panel as recommended by the manufacturer to prevent movement of the cable.

3.08 EQUIPMENT RACKS, BRACKETS AND CABINETS

A. All equipment racks, brackets and cabinets hosting telecommunications equipment shall all be installed in accordance with the manufacturer's recommendations. Permanently anchor all racks to the floor.

3.09 GROUNDING AND BONDING

A. Provide in accordance with TIA J-STD-607, NFPA 70 and as specified in Section 26 0526 GROUNDING & BONDING FOR ELECTRICAL SYSTEMS.

3.10 LABELING

- A. Provide labeling in accordance with TIA/EIA-606. Handwritten labeling is unacceptable. Stenciled lettering for voice and data circuits shall be provided using either thermal ink transfer or laser printing.
- B. Cables shall be labeled using color labels on both ends with identifiers in accordance with TIA/EIA-606.
- C. Workstation outlets and patch panel connections shall be labeled using color coded labels with identifiers in accordance with TIA/EIA-606.

3.11 CABLE TESTING

- A. General: Cables are to be tested after installation is complete with Fluke DTX tester or equivalent and delivered in electronic format for engineer review. If for any reason, the drop location, raceway and/or drop location box is removed for additional work of any nature, the drop location is to be re-tested if previously tested. All cables associated with the drop location are to be re-tested. The cost of re-testing is the responsibility of the cabling contractor.
- B. Category 6/6A Data Unshielded Twisted Pair (UTP) Cable:

- 1. Each UTP CAT 6 data cable installed shall be tested and a test result printout sheet shall be furnished at the completion of the project.
- 2. The test shall be performed after the final cable and device termination has been completed and the faceplate installed. The test shall be of the "Basic Link" from completed end to completed end.
- 3. The test shall be conducted utilizing a scanner that will generate a sweet frequency 1-250 megahertz signal on all pairs of the cable and test each pair of the cable for:
 - a. Pair mapping
 - b. Cable length
 - c. Insertion loss
 - d. Near-End-Cross Talk (NEXT)
 - e. Attenuation to Near-End-Cross Talk Ration (ACR)
 - f. Return loss (RL)
 - g. Power Sum Near-End-Cross Talk (PSNEXT)
 - h. Power Sum Equal Level Far-End-Cross Talk (PSELFEXT)
 - i. Far End Cross Talk (FEXT)
 - j. Propogation Delay & Delay Skew
 - k. Impedance
 - I. Capacitance
 - m. Resistance
- 4. Each data cable shall be tested to EIA/TIA-568, Category 6, compliance for acceptance.
- 5. Each test result shall indicate the cable number, test date and tester name. All test results are to be submitted to the project engineer in electronic format for review during closeout and final acceptance.
- 6. No hand written test results will be accepted by the project engineer.

3.12 EXTRA MATERIALS AND LABOR

A. This contractor shall include in their bid an allowance to install three (3) additional data outlets with an average length of 200 feet as directed by the project engineer at any time during the construction process. Any materials that are not used during construction shall be turned over to the owner at the final acceptance of the building.

SECTION 275132 CABLE TELEVISION DISTRIBUTION SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Coaxial
- B. Accessories

1.02 REFERENCES

A. NFPA 70 - National Electrical Code

1.03 SYSTEM DESCRIPTION

- A. Service entrance from local cable utility.
- B. Premises wiring and conduit for distribution of television signal, including individual outlets.

1.04 PERFORMANCE REQUIREMENTS

A. Signal at each outlet to be 3 dBmV across 75 ohms, minimum +5 dB, -0 dB.

1.05 SUBMITTALS

- A. Shop Drawings: Indicate electrical characteristics and connection requirements. Show installation details, cable routing, and system configuration.
- B. Product Data: Provide showing electrical characteristics and connection requirements for each component.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- D. The cabling contractor shall not begin any installation of materials that require a material fact sheet and/or sample to be submitted and approved by the project engineer. If material is installed prior to approval, the bidder is liable for the cost of removal and replacement if the material is not approved.
- E. The cabling contractor is to provide material cut-sheet for all products (including cabling) listed in this specification, and any other material not listed but required for proper installation.
- F. The cabling contractor is to provide two samples of faceplate, modular jack to owner and architect for review prior to ordering of equipment.

1.06 PROJECT RECORD DOCUMENTS

A. Record actual locations of outlets, devices, and cable routing.

1.07 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Instructions for setting and tuning channels.
- B. Maintenance Data: Basic trouble-shooting procedures.

1.08 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience, and with service facilities within 100 miles of project.
- B. Supplier: Authorized distributor of specified manufacturer with minimum three years experience.
- C. Installer: Franchised installer of specified manufacturer with service facilities within 100 miles of the project.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. The cabling contractor shall coordinate all delivery, storage and handling concerns with the general contractor.
- B. All material and components intended for installation are to be kept dry at all times and protected from weather and contact with damp and/or wet surfaces.

1.10 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 and FCC rules, Part 76.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and indicated.
- C. Conform to requirements of cable television utility company.

1.11 MAINTENANCE SERVICE

A. Furnish service and maintenance of television system for one year from Date of Substantial Completion.

1.12 CLOSE-OUT AND FINAL ACCEPTANCE

- A. The cabling contractor shall provide the following to the owner for final acceptance of the installation.
- B. Working red line drawings, hand completed, indicating the general cable routing of the backbone cables and the primary routes of the horizontal cables. All wall and floor sleeves utilized for cable routing are also to be indicated on this set of drawings. The drawing set utilized for this information is to be a non-working, clean set of drawings.

1.13 APPROVED CABLING VENDORS

- A. All cabling and conductivity products provided by the structured cabling contractor shall be part of the following complete systems:
 - 1. Commscope
 - 2. Belden
 - 3. General Cable
 - 4. Engineer approved equal

PART 2 PRODUCTS

2.01 COAXIAL

- A. Backbone:
 - 1. 14 AWG Solid BC, Aluminum foil and 60% aluminum braid, RG 11.
 - a. Commscope #2287V
 - b. Belden #1617A
 - c. General Cable #C3528
 - 2. Verify color with owner during submittal process.
- B. Branch:
 - 1. 18 AWG Solid BC, Aluminum foil and 60% aluminum braid, RG 6.
 - a. Commscope #2227V
 - b. Belden #1189A
 - c. General Cable #C3525
 - 2. Verify color with owner during submittal process.

2.02 ACCESSORIES

- A. Tap: (Blonder Tongue #GF-81C)
 - Recessed, suitable for mounting with standard duplex receptacle wall plate, all channel back-matched tap.
 - 2. Through Loss: 0.7 dB. maximum.
 - 3. Return Loss: 20 dB, maximum.
 - 4. Isolation as required at each tap to meet specified performance.
 - 5. Connector: "F" type coaxial connector.
 - 6. Device plates are to match receptacles.
- B. Splitter Room: (Blonder Tongue #SUV)
 - 1. 1000 MHz bandwidth
 - 2. RFI shielding of 80dB
 - 3. Die cast housing

- 4. Quantity: Provide as needed for branch and trunk topology.
- C. Splitter Head End: (Blonder Tongue #SXRS)
 - 1. Built-in ground block and RFI shielding of 120dB
 - 2. Quantity: Provide as needed for branch and trunk topology.
- D. Coupler: (Blonder Tongue #SRT)
 - 1. 1000 MHz bandwidth
 - 2. RFI shielding of 80dB
 - 3. Die cast housing
 - 4. Quantity: Provide as needed for branch and trunk topology.
- E. Outlet Jack (1000 MHZ rated)
 - Connector: Type "F" coaxial connector.
 - 2. Device insert/plate to match receptacle plate.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Connect cable television service in accordance with cable utility instructions.
- B. Provide proper grounding of television system components and wiring.
- C. Use plenum rated cable in concealed accessible locations. In locations which are inaccessible, run cable in conduit.
- D. Run 3/4 inch EMT conduit from outlet box to above room ceiling.
- E. Provide outlet jack/plate, conduit, and cable to ceiling space, cable-to-cable entrance location.

3.02 CABLE ROUTING AND MANAGEMENT

- A. Coax cable or shielded intercom/paging cable is not to be installed within the same management supports and/or routed with the UTP data cables. Separate management routes are to be installed. Refer to cable tray specification for details.
- B. Cable routing shall be such that the cable is not closer than six inch (6") from light fixture ballast, 12 inches from conduit and cables used for electrical power distribution and four feet (4') from motors, transformers, and/or any other device capable of emitting RF noise and electromagnetic interference.
- C. Cables not indicated within the design drawings and/or specifications as being spliced are not to be spliced or extended by any means without written approval of the project engineer. Short cables are to be completely removed and a new cable installed at the cabling contractor's expense. Cables are to be continuous from drop location to patch panel.
- D. Any portion of the cabling system considered to be exposed to potential damage by project engineer shall be protected utilizing inner duct, non-metallic wrap tape or some other type of raceway protection as part of the original contract.
- E. J-hooks utilized for cable management and/or routing shall not have a diameter larger than two inches. Cable count routed within any "J-hook" will be limited to 60% of the manufacturer's recommended cable fill.
- F. Cables exposed to view are to be managed utilizing manufactured pre-sized Velcro straps. Plastic cable ties are not to be utilized to secure cables within the wiring closet and will not be accepted by the project engineer.
- G. All cabling is to be routed parallel to structural walls.
- H. The routing of all cable shall be properly managed and supported off the ceiling supports. Management "J-hooks" shall be mounted to the building structure. The management "J-hooks" are to be spaced within five feet (5') of each other and minimal droop, (four inch from parallel), of the cable is to occur between supports. If the cables cannot be kept within this minimal drop, additional supports are to be added.

3.03 FIELD QUALITY CONTROL

- A. Measure signal level at each outlet.
- B. Coaxial video cable will terminate onto standard video outlets, as described elsewhere in this specification.

3.04 MANUFACTURER'S FIELD SERVICES

A. Supervise final adjustments and tuning of system.

3.05 ADJUSTING

- A. Adjust work under supervision of manufacturer's field service personnel.
- B. Adjust amplifier gain and make other system adjustments to achieve specified output levels at each outlet.
- C. Adjust taps to eliminate spurious interference.

3.06 TESTING

- A. Coaxial Video Cable:
 - 1. Each coaxial video cable installed shall be tested and a test result printout sheet shall be furnished at the completion of the project.
 - The test shall be performed after the final cable termination has been completed. The test shall be of the "Basic Link" from completed end to completed end. Include equipment model used for testing with submittal.
 - 3. The bandwidth of all passive devices shall be from 5 MHz to 750 MHz.
 - 4. The Test Shall Test Each Cable For:
 - a. Signal Level: Each tap should be 10 dBmV +/- 5 dBmV.
 - b. Signal to Noise Ratio: SNR shall not be less than 43 dB.
 - 5. Each test result shall indicate the cable number, test date and tester name. All test results are to be submitted to the project engineer in a neat, clean and orderly nature within a three ring binder. The test sheets are to be divided by panel and in numeric order. Dividers are to be placed between each panel's test sheets.
 - 6. No hand written test results will be accepted by the project engineer.

3.07 DEMONSTRATION

- A. Demonstrate system operation and provide two hours of instruction with manufacturer's training personnel.
- B. Conduct walking tour of project and briefly describe function, operation and maintenance of each component.
- C. Include demonstration of color television operation and specified signal level at two outlets selected by owner.

3.08 EXTRA MATERIALS AND LABOR

A. This contractor shall include in their bid an allowance to install an additional three (3) television outlets with a average length of 50 feet as directed by the project engineer at any time during the construction process. Any materials that are not used during construction shall be turned over to the owner at the final acceptance of the building.

SECTION 280050

BASIC ELECTRONIC SAFETY AND SECURITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Basic Electronic Safety and Security Requirements specifically applicable to Electrical Division Specification Sections.
- B. Division 28 Specification requirements also include, by reference, all Division 00 and 01 specification sections. This contractor is responsible to review these specification sections. Requirements of these specification sections are included as a part of this contract.

1.02 WORK BY OWNER

- A. Owner's Responsibility:
 - Arrange for and deliver owner reviewed shop drawings, product data and samples to contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective or deficient items.
- B. Contractor's Responsibility:
 - 1. Review owner reviewed shop drawings, product data and samples.
 - 2. Review and unload owner purchased materials at site, inspect for completeness and/or damage jointly with the owner.
 - 3. Handle, store, install and finish products. Install electrical wiring and devices.
 - 4. Repair and/or replace items damaged after receipt.

1.03 OWNER OCCUPANCY

- A. The owner will occupy the premises during the construction period.
- B. Limit use of site and premises to allow owner occupancy.
- C. Cooperate with the owner to minimize conflict and to facilitate owner's operations.
- D. Schedule the work to accommodate this requirement.

1.04 REGULATORY REQUIREMENTS

- A. This contractor shall give proper authorities all requisite notices relating to work in his charge, obtain official permits, licenses for temporary construction and pay proper fees for it.
- B. This contractor is to be solely answerable for and shall promptly make good all damage, injury or delay to other contractors, to neighboring premises or to persons or property of the public by himself, by his employees or through any operation under his charge, whether in the contract or extra work.
- C. No attempt has been made to reproduce in these specifications any of the rules or regulations contained in city, state or federal ordinances and codes pertaining to the work covered by these specifications that the contractor be thoroughly familiar with all such ordinances and codes.
- D. The fact that said various rules, regulations and ordinances are not repeated in this specification does not relieve the contractor of the responsibility of making the entire installation in accordance with the requirement of those authorities having jurisdiction.
- E. All work shall comply with the applicable recommendations of:
 - 1. The National Board of Fire Underwriters
 - 2. The ANSI-NFPA 70 National Electrical Code
 - 3. The National Fire Protection Association (NFPA)
 - 4. The Occupations Safety and Health Act (OSHA)
 - 5. IBC Building Code (current) and any current applicable city building and or electrical codes.
 - 6. Fire Protection: Conform to UFC and NFPA
 - 7. ANSI/NFPA 70 National Electrical Code

- F. Obtain permits and request inspections from authority having jurisdiction.
- G. Conform to latest approved versions of codes.

1.05 PROJECT/SITE CONDITIONS

- A. Install work in locations shown on drawings unless prevented by project conditions.
- B. Prepare drawings showing proposed rearrangement of work to meet project conditions, including changes to work specified in other sections. Obtain permission of owner and architect/engineer before proceeding.
- C. This contractor shall, before submitting his bid, visit the site of the project to familiarize himself with locations and conditions affecting his work.
- D. It is the intent of this specification that the contractor furnishes all labor and material required to complete the installation as outlined in the drawings and specifications. No additions to the contract price shall be allowed due to the failure of this contractor to properly evaluate the effect of existing conditions on the work to be done under this contract.
- E. Whenever renovation or remodeling or relocation of existing equipment is included in the contract, it is imperative that all locations of existing wiring conduits, electrical panels, equipment, services and grades be noted on the job site before bid is submitted and that all elevations and grades be verified before roughing in new work.
- F. This contractor shall provide holes as necessary for the installation of his work and in accordance with materials other than the structure.

1.06 SEQUENCING AND SCHEDULING

- A. This contractor shall arrange his work in order that it progresses along with the general construction of the building.
- B. This contractor shall be kept informed as to the work of other trades engaged in this project and shall execute his work in such a manner so as not to delay or interfere with progress of other contractors.
- C. Where space for electrical lines and conduit is limited, it is imperative that all such trades coordinate their work so as to insure concealment in space provided. Where conflict exists, the engineer shall decide priority of space. If work is not properly coordinated, the engineer may require removal and relocation of work without additional compensation.

1.07 GUARANTEE

- A. This contractor shall guarantee all of the apparatus, materials, equipment furnished and labor installed under this contract for a period of one year after date of final acceptance, unless a longer period is specified.
- B. Neither final certificate of payment nor any provisions in the contract documents nor partial or complete occupancy of premises by owner shall constitute an acceptance for work not done in accordance with contract documents or relieve the contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship.
- C. Should any defects arise as the result of defective workmanship or material within the guarantee period set forth, this contractor shall make the necessary correction at his own expense.

1.08 ENGINEER APPROVED EQUAL PRODUCTS

- A. When the engineer, at the request of the interested parties, including the contractor, supplier and manufacturer approved "engineer approved equal" products for this project, such products are approved on the assumption that they will equal or exceed the performance of the products specified.
- B. If such products do not do so after being installed on this project, this contractor shall replace or modify the particular product as necessary to equal the performance of the products specified at no expense to the owner, architect or engineer.

- C. Request for "engineer approved equal" products shall be received by the architect/engineer prior to the last addendum being issued. Requests for substitutions received after this date will not be considered. Substitution requests shall clearly state which products are being considered for substitution. Substitution requests shall include all pertinent product information needed to evaluate the substitution as an "equal".
- D. Similar products shall be all of the same manufacturers and style. There is no exception to this unless prior approval has been granted from engineer.

1.09 OWNER'S RIGHT OF SALVAGE

- A. Before beginning construction the contractor shall check and verify with the owner each item of existing equipment that must be removed.
- B. The owner will designate which items of material or equipment not reused that he may wish to keep. This contractor shall then remove these items with care and store in a location designated by the owner for the owner's disposal.
- C. All other items of equipment to be removed and not specified for reuse in new construction or reserved by the owner for his use shall become the property of the contractor and shall be removed from the site.

1.10 PROTECTION AND MAINTENANCE

- A. The work covered by these drawings and specifications involves all work in the [new] [existing] building.
- B. Where necessary to connect to any existing utility service, this contractor shall contact the owner and shall coordinate any building service connection with the owner so that normal operation to the building is disrupted as little as possible.
- C. Any work to be done in existing structures shall be coordinated with the owner and arrangements made so that traffic flow may be maintained and areas finished where possible before other areas are begun.
- D. This contractor shall protect existing equipment in finished areas from dirt, dust and damage as a result of his work.
- E. Coordinate protection requirements with department heads before beginning construction.
- F. Protect any building openings from unauthorized entry. Coordinate with owner where building entry must be controlled.

1.11 DEMOLITION

- A. This contractor shall be responsible for the demolition and removal of all existing electrical elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be reused".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
 - 4. All elements to be removed are subject to the Owner's Right of Salvage.
- B. Preserve services to the existing facility. Extend/reroute/reconnect the existing systems as required providing for the continued function of these systems.

1.12 CUTTING AND PATCHING

- A. This contractor shall do all cutting and patching necessary for the installation of his work in all existing and new buildings unless otherwise noted.
- B. In areas where the integrity of new or existing fire separation assembly/wall is compromised by the work, this contractor shall be responsible to patch and/or seal openings as necessary to maintain and/or return fire separation to rating as required by applicable codes.
- C. This contractor shall do all cutting and patching required for his work beyond the remodeled areas unless otherwise noted. All finish work shall include patching to match existing adjacent surfaces. Painting shall be by others.

1.13 CLEANING AND RUBBISH

- A. This contractor, upon completion of his work, shall remove all rubbish and debris resulting from his operation and shall remove it from site at his own expense.
- B. As far as his work is concerned, all equipment shall be cleaned and the premises left in first class condition.
- C. This contractor shall maintain the work area each day to prevent hazardous accumulation of waste from his work.

1.14 SEALING AND PENETRATION

- A. Clearance around the piping passing through fire or smoke rated construction shall be sealed to maintain the rated integrity of the construction (1 hr. 2 hrs. etc.). One and two-hour rated assemblies are to be patched on both sides of the assembly.
- B. This contractor shall verify rating and location of all such construction with the architectural drawings and seal all penetrations.
- C. Manufacturer offering products to comply with the requirements include the following:
 - 1. Dow Corning "Silicone RTV Foam"
 - 2. 3-M Corporation "Fire Barrier Caulk and Putty"
 - 3. Thomas & Betts "Flame Safe Fire Stop System"
- D. Installation of these products are to be in strict accordance with the manufacturer's recommendations.
- E. This contractor shall submit shop drawings showing approved sealing assemblies to be utilized on this project.

1.15 HAZARDOUS MATERIALS

- A. If this contractor stores any hazardous solvents or other materials on the site, he shall obtain copies of the safety data sheets for the materials and post them at the site. He shall inform the owner and all employed of any potential exposure to this material.
- B. At no time shall any product containing asbestos be incorporated into the work.
 - If asbestos materials are encountered, report to the owner. The owner will be responsible for asbestos removal.

1.16 AS-BUILT DRAWINGS

- A. This contractor shall provide (at the conclusion of the project) one clean, non-torn, neat and legible "as-built" set of drawings to the owner. These drawings shall show the routing of conduit, wiring and equipment drawn in at scaled locations. All circuits shall be labeled and shall conform to labeled panel breakers. All dimensions indicated shall be referenced to a column line. A set of construction blue prints will be furnished for this work.
- B. All electrical panels and electrical installed equipment shall be shown on the "as-built" drawings.
- C. Refer to Architectural Specification Sections for additional requirements.
- D. This contractor shall update these drawings during the project at least every week.

1.17 ALTERNATES

A. Refer to description of alternate bids under General Specification Sections.

1.18 REVIEW OF MATERIALS

- A. This contractor shall submit to the engineer for review one (1) electronic copy giving a complete list of materials, fixtures, devices and panels he proposes to furnish. The brochure shall contain complete information as to the make of equipment, type, size, capacities, dimensions, and illustration. Three copies reviewed by the engineer shall be returned to the contractor. One copy shall be kept on the job at all times.
- B. Checking of submittal drawings by the engineer does not relieve the contractor of the responsibility for the accuracy of such drawings and for their conformity to drawings and

- specifications unless he notifies engineer, in writing, of such deviation at time such drawings are furnished.
- C. All submittals shall have the date marked on them when the contractor receives them from the supplier. Submittals shall be submitted through the contractor and shall not come direct from the supplier to the architect or engineer.
- D. This contractor shall mark the date and sign each set. This indicates that each of them have been checked in their entirety before submitting to the engineer. Submittals that are not dated and signed by the contractor will not be accepted, or checked and will be marked "resubmit" and sent back to the electrical contractor.

1.19 TEST OF SYSTEMS

- A. This contractor, before concealed, shall test all systems installed under this contract as called for in these specifications and as required by local codes. Tests shall be made in the presence of the engineer, local authorities or their duly authorized representative. Any defects discovered in testing shall be corrected and the tests repeated until all defects are eliminated.
- B. This contractor shall be held responsible for all damage resulting from defects in the system.
- C. Each individual feeder circuit shall be tested at the panel and in testing for insulation resistance to ground; the power equipment shall be connected for proper operation. In no case shall the insulation resistance to ground be less than that required by the National Electrical Code (NEC).

1.20 SCOPE OF WORK

- A. This contractor shall furnish all the labor and material necessary to install a complete safety and security system for the remodeled building.
- B. This contractor shall furnish all the labor and material to install a complete safety and security system in the new building. The system shall include all items of work as outlined in these specifications and on the drawings.
- C. All work shall be performed by a well-qualified and licensed technician with a thorough knowledge of the various systems involved in this building. It shall be this contractor's responsibility to see that his electricians are familiar with all the various codes and tests applicable to this work.
- D. All equipment shall be new and of the type specified by the engineer unless otherwise noted in these specifications or on the drawings to remain and or be reused.
- E. The intent of the specifications and drawings is for complete installation of the systems outlined in the specifications and drawings so that at the conclusion of construction the system will be turned over to the owner complete and ready for safe and efficient operation. The specifications and drawings cannot deal individually with the many minute items that may be eventually required by the nature of the systems.
- F. This contractor is required to furnish and install all such items normally included on systems of this type, which, while not mentioned directly herein or on the drawings are obviously essential to the installation and operation of the system and which are normally furnished on quality installation of this type.
- G. This contractor, shall before proceeding with any work, review the architectural drawings. Any conflict between the electrical and architectural drawings shall be reported to the engineer for clarification.
- H. If there is a discrepancy between the drawings and the specifications or within either document, the more stringent requirement shall be estimated unless brought to the engineer's attention and an addendum is issued for clarification.
- I. The cable that is installed without using raceway shall be neatly routed and supported every three foot (3') by j-hooks. All wiring in mechanical rooms shall be in conduit. All exposed wiring shall be in raceway. No cable shall be allowed to lie on the accessible ceiling tile.
- J. The Fire Suppression Contractor shall establish system elevations prior to fabrication and installation. The Fire Suppression Contractor shall coordinate elevations with other trades. All

elevations shall be coordinated with all trades in the field prior to installation. When a conflict between trades arises, the design team shall be notified immediately prior to further installation however priority shall be as follows:

- 1. Lighting Fixtures
- 2. Gravity flow piping, including steam and condensate
- 3. Electrical bus duct
- 4. Sheet metal
- 5. Cable trays, including access space
- 6. Other piping
- 7. Conduits and wireway

1.21 DAILY HOUSEKEEPING AND CLEANING

- A. At the end of each workday, the contractor shall remove all of his debris, rubbish, tools, and surplus materials from the project work area. The work area shall be broom cleaned and left in a neat and orderly condition. The contractor, for the removal of debris from the project, shall not use the owner's waste disposal facility.
- B. At end of construction, all equipment shall be cleaned and the premises left in first class condition as far as this contractor's work is concerned.

1.22 WALL CONTINUITY (1 HR.)

- A. All items mounted in 1 hr. rated walls requiring an opening larger than a four inch (4") square (16 sq. inches) require the 1 hr. rating not be degraded.
- B. Any branch panel in a 1 hr. wall will require the exterior of the recessed panel be covered with 5/8 inch fire rated gypsum board. This is true for any device requiring more than a 16 sq. inch opening.

1.23 CABLE

- A. The fire alarm system manufacturer shall approve low voltage cable. All low voltage electrical cable, installed as part of a new fire alarm system, shall be plenum rated cable.
- B. Cable installed without using raceway shall be neatly routed and supported every 32 inch by no less than a nylon wire tie or supported in bridle rings. All wiring in mechanical rooms shall be in conduit. All exposed wiring shall be in raceways. No cable shall be allowed to lie on the accessible ceiling tile.

1.24 LOW VOLTAGE CABLE INSTALLATION

A. This contractor is to install if they are licensed to, or contract with a licensed electrician to install conduit serving low voltage cables located in all mechanical rooms and non-accessible areas and exposed structural areas. Use cable trays in other areas as indicated on the drawings. Where cable trays are not accessible, use J-hooks equal to Caddy Cable CAT. Provide hooks with closure holes and cable ties. Mount hooks 32 inch on center.

1.25 TRENCHING AND BACKFILLING

- A. Each contractor is responsible for their own individual trenching and backfilling unless otherwise noted in the drawings or addendum.
- B. All underground utilities, telephone conduit, parking lot lighting, tunnels, etc shall be exactly located prior to digging. This contractor shall be held responsible for all damages caused by failure to do so.
- C. Any backfill shall be tamped and compacted to prevent future settling. The backfill shall be installed to a smooth and level grade and installed in accordance with local codes.
- D. All excess dirt shall be cleared from the area and disposed of as directed by the owner.
- E. Refer to architectural specification sections for additional information.

1.26 DIGITAL MEDIA AGREEMENT

- A. Computer Aided Drafting (CAD) Documents may be available to the contractor for some uses. Contact the engineer prior to bidding to determine what information is available to be transmitted to the contractor in digital form.
- B. When documents are determined to be available, and as requested by the contractor, they will be transmitted upon the completion and execution of the MODUS digital media agreement.

1.27 SECURE NETWORKABLE DEVICES

- A. Update network devices to the most current software/firmware.
- B. Change default password of all networkable devices.
 - 1. Passwords shall have at least eight characters.
 - 2. Include uppercase and lowercase letters, numerals, and special characters
- C. Supply MAC address and serial number of all networkable devices.
- D. Work with the Owner's IT department to align to existing IT standards.
- E. Provide to the owner a printed and/or electronic spreadsheet log of all network information including, IP addresses, MAC addresses, logins and password information during system training.

1.28 SYSTEM CONFIGURATION AND PROGRAMMING FILES

- A. Supply system configuration and programming files where export is available.
- B. Supply uncompiled programming for systems applicable.
- C. All configuration and programming shall be property of the owner at conclusion of the project.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

SECTION 280090

MINOR ELECTRONIC SAFETY AND SECURITY DEMOLITION FOR REMODELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The requirements of the Contract Forms, the Conditions of the Contract, Division 1 - General Requirements and Specification Section 26 0050 - Basic Electrical Requirements "General Provisions" apply to this section.

1.02 SCOPE

- A. This contractor shall be responsible for the demolition and removal of all existing electrical elements within the project area except as follows:
 - 1. Elements shown on the drawings as "existing to remain and/or to be relocated".
 - 2. Elements serving adjacent areas.
 - 3. Elements required for the support of the newly remodeled areas.
- B. Preserve services to the existing facility. Extend, reroute, and reconnect existing systems as required providing for the continued function of these systems.
- C. Demolition shall be accomplished by the proper tools and equipment for the work to be removed. Personnel shall be experienced and qualified in the type of work to be performed.
- D. This contractor shall remove all abandoned equipment, conduit, and supports associated with the remodeled area unless noted otherwise.
- E. This contractor is responsible to provide temporary electronic safety and security protection during this project.

1.03 MATERIALS

- A. All elements to be removed are subject to the Owner's Right of Salvage.
- B. All materials removed shall be the property of the removing contractor and shall be removed from the site by him, unless otherwise specified.
- C. The owner may designate and have salvage rights to any material herein demolished by this contractor. It will be the owner's responsibility to designate such salvageable items and remove them prior to the contractor working in that area.

1.04 EXISTING CONDITIONS

- A. If any existing devices that are to remain are disturbed by operations under this contract, the contractor is required to re-establish continuity of such systems.
- B. This contractor shall arrange for the general contractor to repair and patch all construction with material necessary to match surrounding due to removal of equipment and conduit.
- C. This contractor shall furnish all required labor and material, where required, to extend new work to connect to similar work for extension of existing systems.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Beginning of demolition means installer accepts existing conditions.
- B. Demolition drawings are based on casual field observation and existing record documents. Report discrepancies to the owner before disturbing the existing installation.
- C. Verify field-circuiting arrangements and reconnect as necessary.
- D. Verify that abandoned wiring and devices serve only abandoned facilities. Reconnect circuits, as required, to prevent de-energizing of remaining receptacles of lights.

3.02 PREPARATION

- A. Disconnect safety & security in walls, floors, and ceilings scheduled for removal.
- B. Coordinate service outage with local utility company, inspectors, owners, and design team.
- Provide temporary wiring and connections to maintain existing systems in service during construction.
- D. Existing safety and security services: Maintain existing system in service until new systems are complete and ready for deployment. Disable systems only to make switchover connections. Obtain permission from the owner, at least 24 hours before partially or completely disabling any system. To minimize outage, duration, make temporary connections as required.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switch over and connections. To minimize outage, duration, make temporary connections to main tan service within construction areas and in areas adjacent to work area.
- F. Existing Telephone system: maintain existing system in service.
- G. Existing Building Security System, Video Surveillance, Door Access, and Fire Alarm Systems:
 - 1. Maintain existing system in service until new systems are accepted.
 - 2. Disable system only to make switch over and connections
 - 3. Obtain permission from the owner at least 24 hours before partially or completely disabling system.
 - 4. Minimize outage duration.
 - 5. Make temporary connections to maintain service in areas adjacent to work areas.

3.03 DEMOLITION AND EXTENSION OF EXISTING SAFETY AND SECURITY

- A. Demolish and extend existing safety and security work under provisions of this section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors and patch surfaces.
- E. Disconnect abandoned cable and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide a blank cove for abandoned devices that have not been removed.
- F. Disconnect and remove abandoned control panels and head end equipment.
- G. Disconnect and remove devices and equipment service abandoned safety and security system.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing safety and security installations that remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installation using materials and methods compatible with existing electrical installations or as specified.

3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials that remain or are to be reused.
- B. Control Panels: Clean exposed surfaces and check tightness of all connections. replace damaged items and equipment. Provide typed directory showing revised changes or programming.

3.05 INSTALLATION

A. Install relocated materials and equipment.

SECTION 283100

FIRE DETECTION AND ALARM (EXISTING/REMODELING)

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm and smoke detection control panel
- B. Peripheral devices
- C. Fire alarm wire and cable
- D. Sprinkler flow and tamper switch
- E. Remote annunciator panel

1.02 RELATED SECTIONS

- A. Specification Section 08 7100 Door Hardware
- B. Specification Section 260533 Raceways and Boxes for Electrical Systems

1.03 REFERENCES

- A. NFPA 70 National Electrical Code
- B. NFPA 72 National Fire Alarm Code
- C. NFPA 101 Life Safety Code
- D. International Building Code 2015
- E. International Existing Building Code 2015
- F. International Fire Code 2015
- G. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems

1.04 SYSTEM DESCRIPTION

- A. Fire Alarm System: NFPA 72, manual and automatic local fire alarm system.
- 3. Fire alarm system shall include the system wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm and supervisory signal initiating devices, alarm notification appliances and other accessories required for a complete operating system.

1.05 SUBMITTALS

- A. Shop Drawings: Provide a building layout showing each device and wiring connection required.
- B. Product Data: Provide electrical characteristics and connection requirements.
- C. Test Reports: Indicate satisfactory completion of required tests and inspections.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation and starting of products.
- E. Contractor shall submit software logic, flow diagrams, battery calculations and one line diagrams illustrating device loops.
- F. Contractor shall be responsible for submitting a copy of these documents to the local Authority Having Jurisdiction or state for required review.
- G. Submit copies of NICET certifications as described in this specification section.

1.06 PROJECT RECORD DOCUMENTS

- A. Record actual locations of initiating devices, signaling appliances, shut down relays, power supplies, and end-of-line devices.
- B. Indicate device addresses on this drawing.
- C. Deliver to owner as both hard copy and electronic file.

1.07 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Operating instructions.
- B. Maintenance Data: Maintenance and repair procedures.
- C. Configuration Data: Printouts of configuration settings for all devices.
- D. Routine Maintenance Checklist.

1.08 QUALIFICATIONS

- A. Contractor: The contractor shall have a fully equipped, factory trained, and manufacturer certified service and installation organization.
- B. Supervisor: The job supervisor shall be a NICET Level II (or higher) technician and be a full-time employee of the certified reseller. Supervisor shall be responsible for programming and testing.
- C. A job site supervisor is to be present on-site at all times during installation. The supervisor shall be a NICET Level II (or higher) technician.
- D. Installer: All work relating to the fire alarm shall be performed by a NICET Level I (or higher) technician.
- E. A list of technicians with any level of responsibility with this project shall be submitted for review and acceptance during the submittal process. A copy of their NICET Certification and manufacturer's training certificate for the system to be installed shall also be included.
- F. Installer shall be capable of answering trouble calls from a permanently maintained location less than 100 miles from project site.

1.09 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 and NFPA 101.
- B. Furnish products listed and classified by UL, FM as suitable for purpose specified and indicated.

1.10 EXTRA LABOR AND MATERIALS

- A. Provide 1 installed automatic smoke detectors including 40 feet of wiring each per device to be positioned by the owner or engineer.
- B. Provide 1 installed automatic heat detectors including 40 feet of wiring each per device to be positioned by the owner or engineer.
- C. Provide 1 installed audible/visual alarms including 40 feet of wiring each per device to be positioned by the owner or engineer.
- D. Provide a minimum of six keys of each type.
- E. Devices not installed at the direction of the owner or engineer shall be turned over to the owner at the completion of the project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Match existing.
- B. No engineer approved equal.

2.02 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

- A. Main Control Panel: Existing panel to remain. Expand panel as necessary to provide sufficient initiating and indicating circuits.
- B. Test and verify automatic telephone dialer module. Notify the design team of any issues.

2.03 PERIPHERAL DEVICES

A. Manual Fire Alarm Station: Fire alarm pull stations semi-flush compatible with existing fire alarm control panel.

- B. Thermo-Detectors: Area thermo-detectors shall be 135 deg F rate of rise and fixed. They shall cover 2500 sq. ft. Detectors shall be compatible with existing fire alarm control panel.
- C. Automatic Smoke Detectors: Area smoke detectors shall operate on the photo-electric principle using a stable LED light source and a silicone photodiode to form a very highly accurate means of smoke detection and shall be so designed for a 360 degree smoke entry for optimum response. Regardless of sensitivity setting the detector stability shall be unaffected by high air velocity. Detectors shall be compatible with existing fire alarm control panel.
- D. Horn/Strobe Indicators: Wall mounted shall comply with Americans with Disabilities Act and compatible with existing fire alarm control panel.
- E. Horn/Strobe Combination Unit: Flush mounted combination unit with red thermoplastic faceplate, "FIRE" in white letters.
- F. Strobe Only Unit: Xenon light.
- G. Fire Door Hold Opens:
 - 1. Door Release Type: Door closers shall be furnished and installed by the general contractor and wired by electrical contractor in a separate raceway.
 - 2. Magnetic Type: Furnish and install where indicated on the drawings.
 - 3. Door closers shall be controlled by the fire alarm panel control modules that release the 120 volt door holder magnets. Verify voltage with the general contractor.
- H. Apartment Mini Horn/Strobe: Wall mounted to comply with Americans with Disabilities Act and be compatible with existing fire alarm control panel.

2.04 FIRE ALARM WIRE AND CABLE

- A. Fire Alarm Power Branch Circuits: Building wire as specified.
- B. Initiating Device and Indicating Appliance Circuits: All fire alarm wiring shall be in metallic conduit or open raceway system as specified. Concealed in finished area. Wiring shall be as specified by the manufacturer.
- C. Total load carrier by conductors in each conduit at any voltage shall be limited to 5 amperes. Voltage above 30 VAC-DC shall be in a separate conduit. Wire shall be color coded as follows:
 - 1. Detector Power Circuit: Violet (+) and Blue (-)
 - 2. Signal Circuit: Red (+) and Black (-)
 - 3. Fan Shutdown Circuit: Brown (+), White (-) and Green for ground.

2.05 SPRINKLER FLOW AND TAMPER SWITCH

A. This contractor is responsible to wire all flow switches and provide tamper switches on all valves provided by the sprinkler contractor.

2.06 REMOTE ALARM ANNUNCIATOR PANEL

A. Furnish and install where indicated on the drawings a remote annunciator panel. Panel shall provide alarm/trouble/reset capabilities to match main control panel information and features.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install manual station with operating handle 48 inch on center above finished floor. Install audible and visual signal devices 80 inches above floor or six inches (6") below ceiling, whichever is lower in compliance with ADA standards.
- C. Make conduit and wiring connections to door release, devices, sprinkler flow switches, and sprinkler valve tamper switches. This contractor is responsible for all wiring and conduit to the sprinkler system post indicating valve, when this valve is provided. See drawings for location.
- D. Automatic Detector Installation: Conform to NFPA 72.
- E. This contractor shall relocate all existing devices from existing ceilings and mount on new ceilings. New ceilings are indicated on the drawings.

- F. Provide telephone wire from fire alarm panel to owner's telephone system. Final connection is to be by the owner.
- G. Detector should not be located in areas with excessive exhaust fumes, kitchen areas, near fireplaces or furnace rooms and within three feet (3') of air supply ducts, air diffusers, or ceiling fans.
- H. This contractor shall be responsible for installing an indication system that results in a tone reaching 15 dB over ambient or louder. Horns shall not reach a volume that is greater than 105dB in any room.
- I. This contractor shall be responsible for installing an indication system that meets or exceeds the required strobe intensity per NFPA 72.

3.02 ELECTRICAL REQUIREMENTS

- A. All wiring shall be concealed within walls. No exposed raceways except areas with exposed structure. Coordinate conduit routing with the architect. Provide conduit for wiring located in non-accessible areas. In areas with accessible ceilings, use j-hooks as specified. Provide sleeves through walls and floors (3/4 inch minimum). Do not exceed a 40% pipe fill.
- B. Minimum 3/4 inch conduit size.
- C. Fire alarm cable installed in conduit shall not be shared by any other low voltage system cable.
- D. Make conduit and wiring connections to door release devices, sprinkler flow switches, and sprinkler valve tamper switches. This contractor is responsible for all wiring and conduit to the sprinkler system post indicating valve, when this valve is provided. See drawings for location.
- E. Provide and Install insulated bushing on end of raceways.
- F. All fire alarm devices, junction and pull boxes shall be installed so they are easily accessible without removing light fixtures, equipment, conduits, junction boxes or other items.
- G. Provide locking breaker on 120 VAC power source and label "Fire Alarm." Locking breaker shall be painted red. Any power source to FACP or devices shall be labeled with location of Power source for room number, panel and circuit number.
- H. Fire alarm control and remote power panel's power shall be supplied by a surge protected dedicated circuit(s).
- I. Auxiliary functions that are powered from a remote source must be monitored for power if they do not go to the operational mode for fire protection. (i.e. A power opener purge door that must open to purge air through building or a stairway air pressurization fan that must be monitored for power in case the breaker is shut off.)

3.03 FIELD QUALITY CONTROL

- A. Test in accordance with NFPA 72.
- B. Upon completion of the fire alarm system installation, this contractor shall provide a written statement advising the architect of completion and to be in compliance with fire and electrical codes and in accordance with wiring diagrams, instructions and directions provided by the manufacturer.
- C. Representative of the manufacturer shall certify the system complete and that the owner has received adequate instructions in system operation.

3.04 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start system.
- B. Include services of certified technician to supervise installation, adjustments, final connections, and system testing.

3.05 ADA HEIGHT

A. The new fire alarm devices will require new back boxes for the new audio/visual alarm signals. Install at the new ADA height of 80 inches to the center of the flashing light. ADA requires 48

- inches to the operating mechanism of any pull station, which is newly installed in order to comply with a wheel chair bound person's forward reaching.
- B. The devices mounted below 80 inches shall not protrude from the wall over four inch (4") to comply with ADA.

3.06 CABLE

- A. The fire alarm system manufacturer shall approve the low voltage cable. All low voltage electrical cable that is installed as part of the new fire alarm system shall be plenum rated cable where required.
- B. The cable that is installed without using raceway shall be neatly routed and supported every three foot (3') by no less than a nylon wire tie or supported in bridge rings. All wiring in mechanical rooms shall be in conduit. All exposed wiring shall be in raceway. No cable shall be allowed to lie on the accessible ceiling tile.

3.07 EXISTING FIRE ALARM STATUS

- A. The electrical contractor shall document all alarms associated to the fire alarm system and contact owner prior to performing general demolition.
- B. Electrical contractor shall respond to and resolve any nuisance trouble conditions from fire alarm system due to related construction project. Nuisance troubles shall be resolved with maintenance staff within 24 hours of notification of trouble.

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