

Hannaford

Supermarket & Pharmacy

Portland, Maine

295 Forest Ave, Portland, Maine

Issued for Construction – 6/19/15



WBRC Architects - Engineers

44 Central Street
Bangor, ME 04401
207-947-4511

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SECTION 010700 - STANDARD ABBREVIATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Provide a standard list and rules for uniform usage of abbreviations used in the Contract Documents.
- B. Provide definitions of terms which are common to multiple sections of the Specifications and/or Drawings and which are necessary for proper understanding of those documents.

1.02 ABBREVIATIONS

- A. Trend in usage is towards simplification.
- B. Abbreviations are used without periods unless the abbreviation itself spells a word.
- C. Except where noted, uppercase abbreviations are used on the Drawings and in the Bid Schedule. Lowercase abbreviations are used in text, such as in the Specifications.
- D. Acronyms, words formed from the first (or first few) letters of a series of words, remain capitalized wherever used, except where the term has come into common usage (e.g., radio).
- E. Standard abbreviations are as follows:

ABV	Above	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
AFF	Above Finished Floor		
AFG	Above Finish Grade		
ABUT	Abutment	ASME	American Society of Mechanical Engineers
AP	Access Panel	AWS	American Welding Society
ACT	Acoustical Tile	AWG	American Wire Gage
ABS	Acrylonitrile-Butadiene- Styrene	AMP	Ampere
ADD	Addendum	ANC	Anchor, Anchorage
ADH	Adhesive	AB	Anchor Bolt
ADJ	Adhesive	ANOD	Anodized
AGG	Aggregate	ACH	Anti-Condensate Heater
A/C	Air Conditioning	APPROX	Approximate
AHU	Air Handling Unit	ARCH	Architect(ural)
ALM	Alarm	AD	Area Drain
ALT	Alternate	ACP	Asbestos Cement Pipe
AC	Alternating Current	@	At
ALUM	Aluminum	ASPH	Asphalt
AL/GL	Aluminum/Glass	ATM	Atmosphere
AMB	Ambient	AUTO	Automatic
ACI	American Concrete Institute	AUX	Auxiliary
AISC	American Institute of Steel Construction	AVG	Average
ANSI	American National Standards Institute		
ASTM	American Society For Testing & Mat.		

ADDL	Additional	CM	Centimeter(s)
B&B	Ball and Burlap	CT	Ceramic Tile
BLST	Ballast	CHBD	Chalkboard
BSMT	Basement	CHAM	Chamfer
BP	Base Plate	CV	Check Valve
BRG	Bearing	CIRC	Circle/Circumference
BPL	Bearing Plate	CKT	Circuit
BJT	Bed Joint	CO	Clean Out/Conduit Only
BM	Bench Mark	CLR	Clear(ance) or Cooler
BEL	Below	CLS	Closure
BTWN	Between	COAX	Coaxial
BVL	Beveled	CW	Cold Water
BIT	Bituminous	COL	Column
BLK	Block	COMB	Combination
BLKG	Blocking	COMP	Composition (Composite)
BD	Board	COMPO	Compress(ed) (ion) (ible)
BOL	Bollard	CONC	Concrete
BDBM	Bond Beam	CMU	Concrete Masonry Unit
BS	Both Sides	CP	Concrete Pipe, Complete Penetration Groove Welds
BW	Both Ways	CRSI	Concrete Reinforcing Steel Institute
BOT	Bottom	CONFIG	Configuration
BC	Bottom Chord/Bedding Class	CONST. JT.	Construction Joint
BO	Bottom Of	CONTR	Contractor
BOF	Bottom of Footing	COORD	Coordinate
BHP	Brake Horsepower	CONN	Connection
BRK	Brick	CONST	Construction
BTU	British Thermal Unit	CONT	Continuous or Continue
BRZ	Bronze	CJ	Control Joint
BLDG	Building	COP	Copper
BUR	Built Up Roofing	CORR	Corrugated
BBD	Bulletin Board	CAP	Corrugated Aluminum Pipe
BV	Butterfly Valve	CMP	Corrugated Metal Pipe
CAB	Cabinet	CTR	Counter
CUH	Cabinet Unit Heater	CRS	Course
CAM	Camber	CFM	Cubic Feet Per Minute
CTLV	Cantilever	CFS	Cubic Feet Per Second
CPL	Cap Plate	CF	Cubic Foot
CPT	Carpet(ed)	CU IN	Cubic Inches
CIP	Cast-In-Place/Cast Iron Pipe	CY	Cubic Yard
CI	Cast Iron	DPR	Damper
CB	Catch Basin	DP	Dampproofing
CK	Calk(ing) Caulk(ing)	DL	Dead Load
CLG	Ceiling	DEG	Degree
CG	Ceiling Grille	°C	Degrees Centigrade/Celsius
CLG HT	Ceiling Height	DEMO	Demolish, Demolition
CEM	Cement	DMT	Demountable
CML	Cement Mortar Lined	DENS	Density
CTR	Center	DEPT	Department
CC	Center to Center	DEC	Department of Environmental
CL	Center Line		

	Conservation	EQ	Equal
DEP	Department of Environmental Protection	EQP	Equipment
DOT	Department of Transportation	EDR	Equivalent Direct Radiation
DTL	Detail	EST	Estimate
DIAG	Diagonal	ETC	Etcetera
DIM	Dimension	EVAP	Evaporator
DIA	Diameter	EXCA	Excavate
DIFF	Difference	EXH	Exhaust
DC	Direct Current	EF	Exhaust Fan
DISCH	Discharge	EG	Exhaust Grille
DPR	Dispenser	EXG	Existing
DIST	Distribution	EB	Expansion Bolt
DO	Ditto	EXP JT	Expansion Joint
DIV	Division	EJC	Expansion Joint Cover
DR	Door/Drain/Dimension Ratio	EXP	Exposed
DBL	Double	EP	Explosion Proof
DA	Double-acting	EXT	Exterior
DPDT	Double Pole Double Throw	EXTG	Extinguisher
DPST	Double Pole Single Throw	ES	Extra Strength
DWLS	Dowels	EXT	Extension/Extended
DN	Down	FWC	Fabric Wall Covering
DS	Downspout/Disconnect Switch	FAB	Fabricate
D	Drain	F TO F	Face to Face
DRB	Drainboard	FM	Factory Mutual
DT	Drain Tile	F	Fahrenheit (Degrees)
DWR	Drawer	FCU	Fan Coil Unit
DWG	Drawing	FAS	Fasten
DF	Drinking Fountain	FPM	Feet Per Minute
DIP	Ductile Iron Pipe	FPS	Feet Per Second
EA	Each	FT	Feet/Foot
EIFS	Exterior Insulation and Finish System	FB	Fiberboard
EF	Each Face or Exhaust Fan	BGL	Fiberglass
EW	Each Way	FRP	FiberReinforcedPolyester/Pipe or Fiber Reinforced Panel
EWTB	Each Way Top and Bottom	FIN	Finish(ed)
E	East	FF	Finished Floor
EFF	Efficiency	FFE	Finished Floor Elevation
ELEC	Electric(al)	FG	Finished Grade/Fire Grille/Floor Grille
EB	Electric Baseboard	FA	Fire Alarm
EC	Electrical Contractor	FE	Fire Extinguisher
EMT	Electrical Metallic Tubing	FEC	Fire Extinguisher Cabinet
EP	Electrical Panelboard	FHC	Fire Hose Cabinet
EWC	Electrical Water Cooler	FH	Fire Hydrant
EL	Elevation	FW	Fire Wall
ELEV	Elevator	FP	Fireproof
EMER	Emergency	FRC	Fire-Resistant Coating
EMPS	Emergency Power Supply	FRT	Fire-Retardant
ENCL	Enclos(ure)	FIXT	Fixture
ENGR	Engineer	FLG	Flashing
ENT	Entrance	FLX	Flexible
EPA	Environmental Protection Agency		

FC	Flexible Connection/Foot Candle/Forward Curved	HDW	Hardware
FLR	Floor(ing)	HWD	Hardwood
FLCO	Floor Cleanout	HDR	Header
FD	Floor Drain/Fire Damper	HT	Heat
FLRPL	Floor Plate	HTR	Heater
FLUOR	Fluorescent	HTG	Heating
FJT	Flush Joint	HVAC	Heating/Ventilating/Air Conditioning
FTG	Footing	HD	Heavy Duty
FDN	Foundation	HGT	Height
FRP	Fiber Reinforced Plastic Paneling	HCAP	Helically Corrugated Aluminum Pipe
FR	Frame(d), (ing)	HCMP	Helically Corrugated Metal Pipe
FRZR	Freezer	HZ	Hertz
FBO	Furnished By Other/Owner	HEX	Hexagonal
FUR	Furred (ing)	H	High
FUT	Future	HID	High Intensity Discharge
FIBO	Furnished and Installed By Others/Owner	HP	High Point
GA	Gage, Gauge	HPS	High Pressure Sodium/High Pressure Steam
GAL	Gallon	HC	Hollow Core
GPD	Gallons Per Day	HM	Hollow Metal
GPH	Gallons Per Hour	HORIZ	Horizontal
GPM	Gallons Per Minute	HP	Horse Power (Mech/Elect), High Point & H Pile (Struct)
GALV	Galvanized	HB	Hose Bibb
G	Gas/Girder	HW	Hot Water
GKT	Gasket(ed)	HWH	Hot Water Heater
TV	Gate Valve	HR	Hour
GC	General Contract(or)	HYD	Hydrant
GEN	General/Generator	HPTD	High Point of Trench Drain
GL	Glass, Glazing	ILL	Illumination
GLB	Glass Block	INCAND	Incandescent
GST	Glazed Structural Tile	IN	Inch/Inches
GOVT	Government	INCIN	Incinerator
GB	Grab Bar/Grade Beam	INCL	Include(d), (ing)
GRD	Grade, Grading	INFO	Information
GRN	Granite	ID	Inside Diameter
GRTG	Grating	INSUL	Insulate(d), (ion)
GVL	Gravel	INSC	Insulating Concrete
GFA	Gross Floor Area	INSF	Insulating Fill
GLA	Gross Leasable Area	INT	Interior
GND	Ground	INTM	Intermediate
GRCI	Ground Fault Circuit Interrupter	INV	Invert
GRT	Grout	IPS	Iron Pipe Size
GYP	Gypsum	IG	Isolated Ground
GWB	Gypsum Wall Board	JC	Janitor's Closet
GP	Gypsum Plaster	JT	Joint
HD	Hand Dryer	JST	Joist
HOA	Hand-Off-Automatic	JB	Junction Box
HGR	Hanger	KP	Kickplate
HBD	Hardboard	KV	Kilovolt

KVA	Kilovolt Ampere	MED	Medium
KVAR	Kilovolt Ampere Reactive	MDO	Medium Density Overlay
KWH	Kilowatt Hour	MPS	Medium Pressure Steam
KW(s)	Kilowatt(s)	MBR	Member
K	Kips	MMB	Membrane
KSI	Kips per Square Inch	HG	Mercury
KO	Knockout	MV	Mercury Vapor/Millivolts
LBL	Label	MTL	Metal
LAB	Laboratory	MH	Metal Halide/Manhole
LAD	Ladder	M	Meter(s)
LAM	Laminate(d)	MID	Middle
LDG	Landing	MPH	Miles Per Hour
LAV	Lavatory	MA	Milliamperes
LH	Left Hand	MM	Millimeter(s)
LHR	Left Hand Reverse	MIN	Minimum
L	Length	MWK	Millwork
LPL	Leveling Plate	MG	Mirror Glass/Thousand Gallons
LT	Light	MISC	Miscellaneous Channel/Moment Connection
LTG	Lighting	MOD	Modular/Module
LA	Lightning Arrestor	MLD	Molding, Moulding
LD	Linear Diffuser	MR	Mop Receptor
LF	Linear Foot	MOS	Mosaic
LL	Live Load	MCC	Motor Control Center
LOC	Location	MT	Mount(ed), (ing)
LRA	Locked Rotor Amps	MHT	Mounting Height
LKR	Locker	MOV	Moveable
LG	Long/Length	MUL	Mullion
LLV	Long Leg Vertical	NL	Nailable
LLH	Long Leg Horizontal	NEC	National Electric Code
LVR	Louver	NFPA	National Fire Protection Agency
LP	Low Point	NAT	Natural
LPS	Low Pressure Steam	NPRN	Neoprene
LNG	Longitudinal	NRC	Noise Reduction Coefficient
LV	Low Voltage	NOM	Nominal
LPW	Lumen Per Watt	NST	Non-Slip Tread
LPTD	Low Point of Trench Drain	NFSD	Nonfused
MACH	Machine	NC	Normally closed
MB	Machine Bolt	N	North
MAG	Magnet	NA	Not Applicable
MDP	Main Distribution Panel	NIC	Not In Contract
MAINT	Maintenance	NTS	Not To Scale
MFG	Manufacture(r)	NO	Number/Normally Open
MGR	Manager	OFF	Office
MAS	Masonry	OHM	Ohmmeter
MO	Masonry Opening	OC	On Center(s)
ML	Match Line	OPG	Opening
MTL	Material(s) or Metal	OPP	Opposite
MAX	Maximum	OPH	Opposite Hand
MECH	Mechanical	OPS	Opposite Surface
MJ	Mechanical Joint		

OPT	Optional	PFB	Prefabricate(d)
OZ	Ounce	PFN	Prefinished
OTO	Out To Out	PRF	Preformed
OD	Outside Diameter	PRIM	Premolded
OF	Outside Face	PREP	Prepare
OA	Overall/Outside Air	PRES	Pressure
OH	Overhead	PB	Prestressed Beam/Pull Box/Push Button
PT	Paint(ed)/Potential Transformer	PSC	Prestressed Concrete
PR	Pair	PRI	Primary
PNL	Panel	PROJ	Project/Projection
PB	Panic Bar	PL	Property Line
PTD	Paper Towel Dispenser	PSIA	PSI absolute
PTR	Paper Towel Receptor	PSIG	PSI Gage
PRL	Parallel	POJ	Push on Joint
PKG	Parking/Package	QTY	Quantity
PW	Pass Window	QT	Quarry Tile
PBD	Particle Board	QTR	Quarter
PTN	Partition	RBT	Rabbet
PVMT	Pavement	RL	Rainwater Leader
PED	Pedestal	RTD	Rated
PDT	Pendant	RCVG	Receiving
PCT	Percent	RCPT	Receptacle
PERF	Perforate(d)	REC	Recessed
PCAP	Perforated Corrugated Aluminum Pipe	RECIRC	Recirculate
PCMP	Perforated Corrugated Metal Pipe	RECOM	Recommendation
PERI	Perimeter	RECT	Rectifier/Rectangle
PH	Phase	RE	Refer
PCS	Pieces	REF	Reference
P	Pilot Light Pole/Pump	RFL	Reflect(ed), (ive), (or)
PLAS	Plaster	REFR	Refrigeration
PLAM	Plastic Laminate	RCCP	Reinforced Concrete Cylinder Pipe
PC	Plastic Curtain	RCP	Reinforced Concrete Pipe
PL	Plate	RCPP	Reinforced Concrete Pressure Pipe
PG	Plate Glass/Plate Girder	RPMP	Reinforced Plastic Mortar Pipe
PWM	Plumbing	REG	Register/Regulating
PWD	Plywood	REINFG	Reinforcing
PVC	Polyvinyl Chloride	R&D	Remove and Dispose
PE	Porcelain Enamel	R&R	Remove and Reset
PCP	Portland Cement Plaster/Precast Concrete Panel	R&S	Remove and Store
PIV	Post indicator valve	REQD	Required
LB(s)	Pound(s)	RES	Resilient
PCF	Pounds Per Cubic Foot	RETWALL	Retaining wall
PLF	Pounds Per Lineal Foot	RET	Return
PSF	Pounds Per Square Foot	RA	Return Air
PSI	Pounds Per Square Inch	RAG	Return Air Grille
PWR	Power	RG	Return Grille
PF	Power Factor	REV	Revision(s), Revised
PS	Power Supply	RPM	Revolutions Per Minute
PC	Precast Concrete	RT	Right
		RH	Right Hand/Relative Humidity

RHR	Right Hand Reverse	SC	Solid Core
ROW	Right of Way	SA	Sound Attenuator/Supply Air
R	Riser/Return/Radius/ Thermal Resistance	STC	Sound Transmission Coefficient
RF	Roof	SP	Soundproof
RD	Roof Drain/Return Diffuser	SND	Sounds/Sanitary Napkin Disposal
RFH	Roof Hatch	S	South/Supply
RFG	Roofing	SP	Space/Spare/Static Pressure
RTU	Roof Top Unit	SP'D	Spaced
RM	Room	SP'G	Spacing
RO	Rough Opening	SPKR	Speaker
RIC	Rough-In and Connect	SPEC	Specification(s)
RI	Rough-In Only	SPECD	Specified
RND	Round	SPKLR	Sprinkler
RB	Rubber Base	SQ	Square
RBT	Rubber Tile	SF	Square Feet
RBL	Rubble	SI	Square Inches
ROB	Run-Of-Bank	SY	Square Yard(s)
RJ	Rustication Joint	STAGG	Staggered
SFGL	Safety Glass	SSTL	Stainless Steel
SNTD	Sanitary Napkin and Tampon Dispenser	STD	Standard
SS	Sanitary Sewer	C	Standard Channel/Conduit
SCH	Schedule(d)	SDR	Standard Dimension Ratio
SNT	Sealant	STA	Station
STG	Seating	ST	Steam/Tee Cut From S Shapes/Sub Total
SEC	Second	STL	Steel
SECT	Section	SDI	Steel Deck Institute
SENS	Sensible	SJI	Steel Joist Institute
SERV	Service	SSPC	Steel Structures Painting Council
SSK	Service Sink	STIF	Stiffener
SH	Shear	STPR	Storage
SC	Shear Connection	SD	Storm Drain
SHPL	Shear Plate	STR	Structural
SHTG	Sheathing	TS	Structural Tube
SHT	Sheet	SAG	Supply Air Grille
SMACNA	Sheet Metal & A.C. Contractors National Association	SF	Supply Fan
SH	Shelf, Shelving	SR	Supply Register
SHO	Shore(d), (ing)	SUP	Support
SIM	Similar	SURF	Surface
SPDT	Single Pole Double Throw	SUSP	Suspended
SPST	Single Pole Single Throw	SW	Switch/Soft Water/Solvent Weld
SK	Sink	SWBD	Switchboard
SKL	Skylight	SWGR	Switchgear
SL	Sleeve	SYM	Symmetrical
SLDG	Sliding	SYN	Synchronous/Synthetic
SL	Slope	SYS	System
SD	Smoke Detector/Storm Drain/Supply Diffuser	TKBD	Tackboard
SOL	Solenoid	TKS	Tackstrip
		TK	Tank
		TEL	Telephone
		TV	Television

TD	Temperature Difference/Trench Drain	V	Valve/Volt/Voltage
TE	Temperature Entering	VB	Vapor Barrier
TEMP	Temperature/Temporary	VP	Vapor Proof/Vent Pipe
TEN	Tension	VT	Vapor Tight
TZ	Terrazzo	VAV	Variable Air Volume
TH	Test Hole	VAR	Varnish
T-STAT	Thermostat	VEH	Vehicle
THK	Thick(ness)	VEL	Velocity
MBH	Thousand BTU Per Hour	VNR	Veneer
MCM	Thousand Circular Mills	VTR	Vent Through Roof
MSF	Thousand Square Feet	VENT	Ventilator/Ventilation
THRD	Threaded	VRM	Vermiculite
THR	Threshold	VERT	Vertical
TC	Time Clock/Top of Curb	VEST	Vestibule
TX	Toilet Exhaust	VB	Vinyl Base
TPD	Toilet Paper Dispenser	VCT	Vinyl Composite Tile
TPH	Toilet Paper Holder	VWC	Vinyl Wall Covering
TPTN	Toilet Partition	VCP	Vitrified Clay Pipe
TOL	Tolerance	VA	Volt Amperes
T&G	Tongue and Groove	VAR	Volt Amperes-Reactive
TON	Tons of Refrigeration	VD	Voltage Drop/Volume Damper
T&B	Top and Bottom	VM	Voltmeter
TOC	Top of Concrete	VOL	Volume
TOF	Top of Footing	WSCT	Wainscot
TOJ	Top of Joist	WTW	Wall to Wall
TOM	Top of Masonry	WH	Wall Hung/Wall Hydrant/Watt Hour
TP	Top of Pavement/Towel Pin/Toe Plate	WR	Waste Receptacle
TOP	Top of Pier	WRT	Water
TOS	Top of Steel/Slab	WC	Water Closet
TSW	Top of Side Walk	WCOL	Water Columns
TSS	Top of Structural Steel	WHTR	Water Heater
TPW	Top of Wall	WR	Water Repellent
TOT	Total	WP	Waterproofing
TB	Towel Bar	WS	Waterstop
TR	Transom	WM	Wattmeter
TRANS	Transportation/Transformer	WT	Weight/Structural Tee Cut From W Shapes
TRANSV	Transverse	WWF	Welded Wire Fabric
T	Tread	WWM	Welded Wire Mesh
TRTD	Treated	W	West/Width/Watt
TRWLD	Troweled	WL	Wind Load
TL	Twist Lock/Total Load/Temperature Leaving	WDW	Window
TYP	Typical	WG	Wired Glass
U	Undercut/Heat Transfer Coefficient	W/	With
UG	Underground	W/O	Without
UL	Underwriters Laboratory	WD	Wood
UNF	Unfinished	WB	Wood Base
UH	Unit Heater	WP	Working Point/Weld Prep
UNO	Unless Noted Otherwise	YD	Yard
UR	Urinal	YRD	Yard Drain

YR Year
Z Zone

END OF SECTION 010700

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Work covered by Contract Documents.
2. Work Phases.
3. Work under other contracts.
4. Use of premises
5. Owner's occupancy requirements.
6. Specification formats and conventions.

B. Related Section:

1. Division 01 Section "Multiple Contract Summary" for division of responsibilities for the Work.

1.2 PROJECT INFORMATION

A. Project Identification: Hannaford Supermarket & Pharmacy,

1. Project Location: 295 Forest Ave, Portland, Maine

B. Owner: Hannaford Bros. Co.

1. Owner's Representative: George Lekousi, Construction Project Manager, Hannaford Bros. 145 Pleasant Hill Road, Scarborough, ME 04074

C. Architect: WBRC Architects – Engineers, 44 Central Street, Bangor, ME 04401

D. Sustainable Design Requirements

The building shall be built to the **standard** of LEED certified. Certification will **not** be pursued.

E. The Work consists of the following:

1. The Work includes a remodel of a Hannaford Supermarket and Pharmacy

F. Project will be constructed under a single prime contract.

G. Contractor will not be responsible for equipment installation. A refrigeration contractor will handle refrigeration installations, including handling of all refrigerated cases. The HBC equipment installer will install owner-provided store equipment (shelving, racking, etc.)

- H. Contractor shall provide a plumber who has worked on the project and is acceptable to the HBC Project Manager, on site for 8 hours on Friday and 8 hours on the Saturday of Grand Opening.
- I. The refrigeration contractor or the equipment installation contractor will receive HBC equipment deliveries. It is Hannaford Bros. intent to schedule deliveries when these contractors are on the job site, but if necessary, contractor shall unload equipment to avoid returns. Any damage to crates, boxes, packaging or equipment itself shall be noted on the shippers' Bill of Lading. The HBC Equipment Coordinator/Buyer and Project Manager shall also be notified of any damage. HBC will pay for any HBC equipment storage costs and mobilization of equipment trailers, if required. This Contractor shall coordinate delivery and moving of storage trailers.
- J. Obtain a building permit from the town of Portland. Hannaford Bros. has applied for the permit and has paid the building permit fees. Contractor shall be responsible for obtaining a Certificate of Occupancy for this facility 2 weeks before the completion of this contract. All inspection certificates, plumbing and electrical permits and any other permits required to obtain this Certificate of Occupancy are the responsibility of the Contractor.
- K. HBC will designate a building sign installer and pay their fees. Additional interior exit signage needed for local or state codes will be included in this contract

1.3 WORK PHASES

- A. The Work shall be conducted in multiple phases in the following order, with each phase complete - ready for punchlist, before beginning the next phase:
- B. Before commencing Work of each phase, submit a schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.
- C. Adhere to the sequence schedule. Dates that are noted on the sequence schedule are critical. What is not shown is when specific areas are completed, HBC merchandising associates are scheduled to arrive at the store and stock the areas with product. These associates are at other locations working on similar projects when they are not at this facility. We cannot fail to complete the work on the dates indicated because of the merchandising associates' availability.
- D. The sequence schedule dates may change if the HBC project manager determines that it is in the best interest of the project.

1.4 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to areas in which work is performed.
 - a. Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet beyond building perimeter; 10 feet beyond surface walkways, patios, surface parking, and utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas AND stormwater detention facilities) that require additional staging areas in order to limit compaction in the constructed area.
2. Driveways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 OWNER'S OCCUPANCY REQUIREMENTS

- A. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
 1. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 2. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
 3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.
- B. Contractor shall be responsible for completion of the Warranty Service Contractors listing after the contract has been executed, on form provided by Owner

1.6 WORK RESTRICTIONS

- A. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor air intakes.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.
 1. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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 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. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.
 - 2. The Owner reserves the right to select none, some, all, or to increase the quantity of a bid alternate that is bid by unit price

1.3 PROCEDURES

- A. Coordination: Modify 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. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. 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)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

END OF SECTION 012300

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 MINOR CHANGES IN THE WORK

- A. Owner will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustments to the Contract Sum or the Contract Time.

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Owner will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Owner are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within 10 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Owner.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use AIA Document G709 (or similar document) for Proposal Requests.

1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Owner will issue a Change Order.
- B. Change Orders shall be agreed upon the following basis:
 1. Work performed by the Contractor shall be performed on a cost plus 7 percent overhead and profit (combined).
 2. Subcontractors shall be under the same agreement as the Contractor
 3. The general contractor may mark Work performed by subcontractors up 5 percent
 4. Additional work ordered by the Owner's representative shall be performed with no additional contract time unless specifically agreed to in writing by the Owner.
 5. Proposals for changes will be submitted in writing within 10 working days of notification of change. If no proposal is submitted within the stated time frame, no additional charges will be accepted. Proposals will include itemized back up of charges, including man hour rate, material quantities, material prices and mark up.
- C. The Owner reserves the right to accept or reject any proposals.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

1. Weekly Project meetings.
2. Requests for Interpretation (RFIs).
3. Safety Meetings

B. Related Sections:

1. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

- C. **Provide two experienced full-time superintendents for this project. One will supervise work and enforce safety procedures on the night shift while the other will do the same during the day. They will meet in the morning for the coordination between night and day activities. The day superintendent will meet each day with Hannaford Bros. project manager (or designee), store management (when remodel) and then monitor daytime construction activities. Safety is of the utmost concern on all projects.**

1.2 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.3 COORDINATION

- 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.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
5. Provide Hannaford Bros. a man-hour cost breakdown, within three weeks of award of this contract, which will be used on future Change Orders during the project. The cost breakdown will need to include the components making up the regular and overtime wages. Where applicable, different rates will be needed for foremen, journeymen, labor,

etc. This information will be needed from contractor and all subcontractors who will be involved in any Change Order work.

- B. Prepare HBC standard memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors 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.
 - 9. Project closeout activities.
- D. Subcontractor List: Submit, within one week of award of contract, a complete listing of the subcontractors to be used on this project. This list will be subject to approval by Hannaford Bros. Co.
- E. Daily Job Reports: A copy of the daily job reports (from both shifts) are required weekly, and are to be transmitted to the HBC Project Manager by noon Monday following the week being reported. The purpose of these reports is to track work progress and helps substantiate costs for extra work to the project.
- F. Submit Construction Waste Management and Construction IAQ Management Plans
- G. Sustainable Building Requirements: Coordinate work to comply with requirements of Construction Waste Management and Construction IAQ Management Plans.
 - 1. Interior Finishes: Schedule Construction operations with consideration for indoor air quality in accordance with Section 018115.

1.4 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction at a time convenient to Owner, but no later than 5 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
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. All 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. Tentative construction schedule
 - b. Phasing
 - c. Critical work sequencing and long-lead items
 - d. Designation of key personnel and their duties
 - e. Procedures for processing field decisions and Change Orders
 - f. Procedures for RFIs
 - g. Procedures for testing and inspections
 - h. Procedures for processing Applications for Payment
 - i. Distribution of the Contract Documents
 - j. Submittal Procedures
 - k. Preparation of Record Documents
 - l. Use of the Premises and existing buildings
 - m. Work restrictions
 - n. Owner's occupancy requirements
 - o. Responsibility for temporary facilities and controls
 - p. Construction waste management and recycling
 - q. Parking availability
 - r. Office, work, and storage areas
 - s. Equipment deliveries and priorities
 - t. First aid
 - u. Security
 - v. Progress cleaning
 - w. Working hours
 3. Minutes: General Contractor will record and distribute meeting minutes
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires 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. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner (HBC project manager) the contractor's project manager and day superintendent, 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. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. 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) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
3. Minutes: General contractor will record and distribute the meeting minutes to each party present and to parties requiring information.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present
 - 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.
- E. Safety Meetings: Conduct weekly safety meetings with all subcontractors, along with HBC subcontractors, in attendance. Minutes of these safety meetings shall be recorded and forwarded to the HBC project manager. MSDS files shall be on site at all times. Copies of the safety program shall be provided to Hannaford Bros. Co. within one week of the award of a contract for this work. HBC will employ Contractor's Risk Management, Inc. to visit the project periodically and conduct an OSHA focused inspection. If project fails any safety inspection, Contractor's Risk Management will make follow up inspections on a weekly basis at

a cost of \$2500 per visit until safe standards are met. Contractor will pay the cost of these remedial visits.

1. Failed inspection: Inspection that receives a score of 8 or lower.

1.5 REQUESTS FOR INFORMATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 3. RFIs shall be posted to the RFI section of Owner's project extranet web site, and appropriate personnel shall be notified. At a minimum the Owners representative, Architect, and Owner's Design Project Manager shall be notified.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 1. RFI number, numbered sequentially.
 2. Specification Section number and title and related paragraphs, as appropriate.
 3. Drawing number and detail references, as appropriate.
 4. Field dimensions and conditions, as appropriate.
 5. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 6. Contractor's signature.
 7. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. Owner's Action: Owner will review each RFI, determine action required, and return it. Allow seven working days for Owner's response for each RFI.
 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 2. Owner's action may include a request for additional information, in which case Owner's time for response will start again

3. Owner'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 Division 01 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner in writing within 10 days of receipt of the RFI response.
- D. On receipt of Owner's action, immediately distribute the RFI response of affected parties. Review response and notify Owner within seven days if Contractor disagrees with response.
 1. RFI Log - Log will be maintained on Owner's project extranet site..

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Daily construction reports.
 - 3. Field condition reports.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Float: The measure of leeway in starting and completing an activity
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
- C. Major Area: A story of construction, a separate building, or a similar significant construction element.
- D. Contractor's Construction Schedule: Submit two copies of initial schedule, large enough to show entire schedule for entire construction period.
 - 1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- E. Daily Construction Reports: Submit two copies at weekly intervals.
- F. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

1.3 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Owner.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 30 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include not less than 15 days for startup and testing.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.

- e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
3. Work Stages: Indicate important stages of construction for each major portion of the Work.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's construction schedule within 10 days of date established for commencement of the Work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
- 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
- 1. List of subcontractors at Project site.
 - 2. Equipment at Project site.
 - 3. Material deliveries.
 - 4. High and low temperatures and general weather conditions.
 - 5. Accidents.
 - 6. Meetings and significant decisions.
 - 7. Unusual events.
 - 8. Stoppages, delays, shortages, and losses.
 - 9. Meter readings and similar recordings.
 - 10. Orders and requests of authorities having jurisdiction.
 - 11. Services connected and disconnected.
 - 12. Equipment or system tests and startups
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Interpretation on Owner's project extranet site. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013500 - ENVIRONMENTAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes Procedures for achieving the most environmentally conscious Work feasible within the limits of the Construction Schedule, Contract Sum and available materials, equipment and products.
1. Participate in promoting efforts of Owner to create an energy-efficient and environmentally-sensitive structure to the standards of LEED certified
 2. Use recycled-content, non-toxic and environmentally sensitive materials and equipment
 3. Use locally sources materials to the greatest extent possible
 4. Use environmentally sensitive products
 5. Protect the environment, both on-site and off-site, during construction operations.
 6. Prevent environmental pollution and damage
 7. Effect optimum control of solid wastes
- B. Salvage and reuse is a better waste management method than recycling because little or no reprocessing is necessary, thus less pollution is created when items are reused in their original form. Therefore, a diligent effort shall be made to salvage and reused products and materials. Waste materials that cannot be salvaged and reused, and have value as being recyclable, shall be recycled. Only trash shall be transported to a landfill or incinerator. The Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling construction waste for this project. Revenues or other savings obtained for recycling or returns shall accrue to the Contractor.
- C. Related Sections include Section 018115 Sustainable Building Requirements Summary.

1.2 INTENT

- A. General Intent: The Contractor shall use all means available to divert to the greatest extent practical and economically feasible, construction and demolition waste from landfills and incinerators.
1. The Owner has established that this Project shall generate the least amount of waste practical and that processes that ensure the generation of as little waste possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
 2. Of the waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged or recycled. Waste disposal in landfills shall be minimized to the greatest extent practical.
 - a. Recycle and/or salvage at least 95% (by weight) of construction, demolition and land-clearing waste.

- B. Adequate Ventilation: Ventilation, including air circulation and air changes, required to cure materials, dissipate humidity, and prevent accumulation of dust fumes, vapors or gases.
- C. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction , remodeling, repair, and demolition operations
 - 1. Rubbish: Includes both combustible and noncombustible waste, such as paper, boxes, glass, crockery, metal and lumber scrap, metal cans and bones.
 - 2. Debris: Includes both combustible and noncombustible waste, such as leaves and tree trimmings that result from construction or maintenance and repair work..
- D. Chemical Waste: Includes petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals and inorganic wastes.
- E. Diversion: Redirection of waste ordinarily deposited in a municipal landfill to a recycling facility or to another destination for reuse.
- F. Environmental Pollution and Damage: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances, or degrade the utility of the environment for aesthetic, cultural or historical purposes.
- G. Hazardous Materials: Includes pesticides, biocides, and carcinogens as listed by recognized authorities, such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC).
- H. Interior Final Finishes: Materials and products that will be exposed at interior, occupied spaces; including flooring, wallcovering, finish carpentry and ceilings.
- I. Low-emitting and Fuel-efficient vehicles: Vehicles that are either classified as Zero Emission Vehicles (ZEV) by the California Air Resources Boards or have achieved a minimum green score of 40 on the American Council for an Energy Efficient Economy (ACEEE) annual vehicle rating guide.
- J. Municipal Solid Waste Landfill: A permitted facility that accepts solid, non-hazardous waste such as household, commercial, and industrial waste, including construction and demolition waste.
- K. Package Dry Products: Materials and products that are installed in dry form and are delivered to the site in manufacturer's packaging; including carpets, resilient flooring, ceiling tiles and insulation.
- L. Post-consumer material is defined as waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose.
- M. Pre-consumer material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

- N. Preferred Parking: Refers to parking spots that are closest to the main entrance of the project (exclusive of spaces designated for handicapped) or parking passes provided at a discounted price.
- O. Sediment: Soil and other debris that has been eroded and transported by storm or well production runoff water.
- P. Sanitary Wastes:
 - 1. Garbage: Refuse and scraps resulting from preparation, cooking, distribution, or consumption of food.
 - 2. Sewage: Domestic sanitary sewage
- Q. Wet Products: Materials and products installed in wet form, including paints, sealants, adhesives and special coatings.
- R. Recycling Facility: A business that specializes in collecting, handling, processing, distributing or remanufacturing waste materials generated by demolition and new construction projects, into products or materials that can be used for this project or by others.
- S. Salvage and Reuse: Existing usable product or material that can be saved and reused in some manner on the project site. Materials that can be salvaged and reused must comply with the applicable technical specifications and include, but are not limited to, the following:
 - 1. Dimensional lumber and other wood products
 - 2. Structural steel
 - 3. Soil
 - 4. Masonry products
- T. Salvage for Resale: Existing usable product or material that can be saved and removed intact (as is) from the project site to another site for resale to others without remanufacturing.
- U. Trash: Product or material unable to be salvaged for resale, salvaged and reused, returned, or recycled.
- V. Waste Materials: Product or material that can be salvaged for resale, salvaged and reused, returned to vendors or recycled.
- W. Non-Toxic: Not producing or resulting from poison; nonpoisonous
- X. V.O.C. -Volatile organic compounds
- Y. Regional Material: Material that is extracted, harvested or recovered, and manufactured all within 500 miles of the project site.

1.3 SUBMITTALS

- A. Solid Waste Management and Environmental Protection Plan: Not more than ten (10) days after the Preconstruction Meeting, prepare and submit a Solid Waste Management and Environmental Protection Plan, including, but not limited to the following:

1. List of federal, state and local laws, regulations and permits concerning environmental protection, environmental pollution and damage; hazardous materials, construction and demolition waste; chemical waste, sanitary waste, sediment, water, air and noise pollution that are applicable to the Contractor's proposed operations.
 2. Procedures to be implemented to provide the required environmental protection and to comply with the applicable laws and regulations.
 3. List of the recycling facilities, reuse facilities, municipal solid waste landfills and other disposal area(s) to be used, including:
 - a. Name, location and phone number
 - b. Copy of permit or license for each facility
 4. Procedures for Recycling/Re-use Program. Include procedures for protecting bins from use by the general public during off-hours to prevent intermixing of materials
 5. Name, address and phone number for each landfill or incinerator facility to be utilized.
 6. Tipping fee for each landfill or incinerator
 7. A list of waste materials that will be salvaged for resale, salvaged and reused, and recycled.
 8. Anticipated net cost savings determined by subtracting the cost of separating and recycling from the following:
 - a. Savings due to reuse of demolished materials
 - b. Revenue from the sale of salvaged and recycled materials
 - c. Landfill or incinerator tipping fees saved due to diversion of materials to recycling.
 9. Description of the method to be employed in recycling waste materials and description of the method that will be used to protect recycled materials from contamination.
 10. Description of the means of transportation or recycled materials and the destination of the materials.
- B. Revise and Resubmit Solid Waste Management and Environmental Protection Plan as required by Owner.
1. Approval of the Contractor's Solid Waste Management and Environmental Protection Plan will not relieve the Contractor or responsibility for adequate and continuing control of pollutants and other environmental protection measures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 RECYCLING AND REUSE

- A. Manager: The Contractor shall be responsible for instruction workers and overseeing and documenting results of the Solid Waste Management Plan for the Project.
 1. Distribution: The Contractor shall distribute copies of the Solid Waste Management Plan to the Job Site Foreman, each subcontractor, and the Construction Manager.

2. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.
- B. Collection : Implement a recycling/reuse program that includes separate collection of waste materials of the following types as appropriate to local and regional recycling/reuse facilities:
1. Asphalt
 2. Concrete
 3. Metal
 - a. Ferrous
 - b. Non-Ferrous
 4. Wood
 5. Debris
 6. Glass
 7. Clay Brick
 8. Paper/Cardboard
 9. Plastic
 10. Gypsum
 11. Paint
 12. Carpet
 13. Others as appropriate
- C. Recycling/Reuse Centers: Contact governmental solid waste offices, Environmental Protection Agency (EPA) regional offices, and applicable non-profit organizations to identify recycling/reuse centers in the Project area.
- D. Handling:
1. Clean materials that are contaminated prior to placing on collection containers. Deliver materials free of dirt, adhesives, solvents, petroleum contaminants and other substances deleterious to recycling process.
 2. Arrange for collection by or delivery to the appropriate recycling or reuse facility
- E. Participate in re-use programs: Identify local and regional re-use programs, including but not limited to non-profit organizations such as schools, local housing agencies, and public arts programs, that accept used materials. The following are examples for contractor's information only.
1. National materials exchange network, such as CAL-MAX a free services provided by various state and regional offices, designed to help businesses find markets for materials that traditionally would be discarded. The premise of the program is that material discarded by one business may be a resource for another business.
 - a. Items and regions covered by materials exchange programs may vary. Contact the applicable regional materials exchange program.
 2. Habitat for Humanity, a non-profit housing organization that rehabilitates and builds housing for low income families.

- a. Sites requiring donated materials vary. Contact the national hotline (800) HABITAT
- F. Rebates, tax credits and other savings obtained for recycled or re-used materials accrue to Contractor.
- G. Separation Facilities: The Contractor shall lay out and label a specific area to facilitate separation of materials for potential recycling salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Location as acceptable to the Owner.
 - 1. Hazardous Wastes: Any unforeseen hazardous wastes shall be separated, stored, and disposed of according to local regulations and as directed by the Owner.

3.2 ENVIRONMENTAL CONTROLS

- A. Protection of Natural Resources: Preserve the natural resources within the Project boundaries and outside the limits of permanent Work performed under this Contract in their existing condition or restore to an equivalent or improved condition as approved by Owner, upon completion of the Work.
 - 1. Confine demolition and construction activities to work area limits indicated on the Drawings and as directed by Construction Manager.
 - a. Disposal operations for demolished and waste materials that are not identified to be salvaged, recycled or reused.
 - 1) Remove debris, rubbish, and other waste materials that are not identified to be salvaged, recycled or reused
 - 2) No burning permitted
 - 3) Transport materials with appropriate vehicles and dispose off-site to areas which are approved for disposal by governing authorities having jurisdiction.
 - 4) Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways. Remove spillage and sweep, wash or otherwise clean project site, streets or highways
 - 5) Comply with applicable regulations.
 - 2. Air Resources: Prevent creation of dust, air pollution, and odors
 - a. Comply with MERV filtration requirements during construction and prior to occupancy per Section 015720
 - b. Use water sprinkling, temporary enclosures and other appropriate methods to limit dust and dirt rising and scattering in air to lowest practical level.
 - 1) Do not use water when it may create hazardous or other adverse conditions such as flooding and pollution
 - c. Store volatile liquids, including fuels and solvents, in closed containers
 - d. Properly maintain equipment to reduce gaseous pollutant emissions.

- e. Interior final finishes: Schedule construction operations involving wet products prior to packaged dry products to the greatest extent possible in accordance with approved Solid Waste Management and Environmental Protection Plan.
- f. Temporary Ventilation:
 - 1) Provide adequate ventilation during and after installation of interior wet products and interior final finishes
 - 2) Provide adequate ventilation of packaged dry products prior to installation. Remove from packaging and ventilate in a secure, dry, well-ventilated space free from strong contaminant sources and residues. Provide a temperature range of 60 deg F minimum to 90 deg F maximum continuously during the ventilation period. Do not ventilate within limits of Work.
- g. Pre-occupancy Ventilation: After final completion and prior to initial occupancy, provide adequate ventilation for minimum five (5) days. Pre-occupancy ventilation procedures:
 - 1) Use supply air fans and ducts only
 - 2) Temporarily seal exhaust ducts
 - 3) Temporarily disable exhaust fans
 - 4) Provide exhaust through operable windows or temporary openings
 - 5) Provide temporary exhaust fans as required to pull exhaust air from deep interior locations.
 - 6) After pre-occupancy ventilation and prior to final testing and balancing of HVAC system, replace air filters and make HVAC system fully operational.

END OF SECTION 013500

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 inspecting 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 -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections:
 - 1. Divisions 02 through 32 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. 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.
- B. 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. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full size physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review construction, coordination, testing, or operation; Mockups are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Preconstruction Testing: Tests and inspections performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpenter" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter". It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Should a conflict exist in the Documents, request a written clarification from Architect prior to proceeding with affected work.
- B. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Owner for a decision before proceeding.
- C. 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 Owner for a decision before proceeding.

1.4 SUBMITTALS

- A. Qualification Data: 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.
- B. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.

2. Project title and number.
3. Name, address, and telephone number 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 inspecting.
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 re-inspecting.

- C. Permits, Licenses, and Certificates: For Owner's records, 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 QUALITY ASSURANCE

- A. General: 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.
- 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, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- F. 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 for specialists shall not supersede building codes and regulations governing the Work.

- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Factory-Authorized Service 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.
- 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 in location and of size indicated or, if not indicated, as directed by Owner.
 - 2. Notify Owner seven days in advance of dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Owner's approval of mockups before starting work, fabrication, or construction.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 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 inspecting they are engaged to perform.
 - 2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction, whether specified or not.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these 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 inspecting 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 inspecting 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. **Manufacturer's Field Services:** Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures".
- D. **Retesting/Re-inspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. **Testing Agency Responsibilities:** Cooperate with Owner and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Owner and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location 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 any duties of Contractor.
- F. **Associated Services:** Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. **Coordination:** Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.7 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency or 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 Owner 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 Owner with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, that 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 re-inspecting corrected work.
- B. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, 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 Owner 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 Owner with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, that 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 re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, 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. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 2. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Cutting and Patching"
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.
- D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the organizations responsible for the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
CFR	Code of Federal Regulations
DSCC	Defense Supply Center Columbus
ECA	Electronic Components Association
FED-STD	Federal Standard
FS	Federal Specification
FSC	Forest Stewardship Council
FTMS	Federal Test Method Standard
UL	Underwriters Laboratories Inc.
UFAS	Uniform Federal Accessibility Standards

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents

BOCA	BOCA International (see ICC)
IAPMO	International Association of Plumbing and Mechanical Officials

ICBO International Association of Plumbing and Mechanical Officials

ICBO-ES ICBO Evaluation Service, Inc.

ICC International Code Council

C. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE Army Corps of Engineers

CPSC Consumer Product Safety Commission

DOC Department of Commerce

DOD Department of Defense

DOE Department of Energy

EPA Environmental Protection Agency

FAA Federal Aviation Administration

FCC Federal Communications Commission

FDA Food and Drug Administration

GSA General Services Administration

HUD Department of Housing and Urban Development

LBL Lawrence Berkeley National Laboratory

NCHRP National Cooperative Highway Research Program
(See TRB)

NIST National Institute of Standards and Technology

OSHA Occupational Safety & Health Administration

PBS Public Buildings Service
(See GSA)

PHS Office of Public Health and Science

RUS Rural Utilities Service
(See USDA)

SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 014400- GENERAL MATERIALS AND WORKMANSHIP

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Sections include the following:
 - 1. Section 018115 Sustainable Design Requirements Summary
 - 2. Section 014200 References

1.2 STANDARDS OF MATERIALS AND QUALITY

- A. Material shall be new, unless otherwise specified, carefully selected and of the best merchantable-quality
- B. Each material and system provided shall be acceptable to the Architect

1.3 ALTERNATE MATERIALS

- A. Be responsible for the supply and installation of materials, each in accordance with specified standards
- B. Where a preference for a particular material, type of construction, dimension, size or thickness is indicated in the Specification or on the Design Drawings, or a particular method of construction is implied, guarantee that the preference indicated shall satisfy the specified requirements. If considered to be inadequate or inappropriate, make alternative proposals for review by the Architect.
- C. Acceptance of alternative proposals by the Architect shall not relieve the General Contractor from responsibility to provide suitable materials, components and assemblies fit for the purpose intended by the manufacturer and in compliance with the Contract Documents.

1.4 HEALTH HAZARDS

- A. Each proposed material shall not be a current or potential human or pet health hazard. Maintain a full, up-to-date knowledge of current published research and legislation.

1.5 DELETERIOUS MATERIALS

- A. The following materials shall not be used in the Work unless it can be demonstrated, to the satisfaction of the Architect, that they are safe during manufacture, installation and use and that their suitability is ensured:
 - 1. Asbestos or asbestos containing products

2. Lead where the metal or its corrosive products may be directly ingested, inhaled or absorbed. Applications of lead such as roofing, flashings, rainwater goods and copper alloy fittings containing lead which are specifically required are acceptable, until equal or better alternatives are available.
3. Lead based paints and primers
4. Urea Formaldehyde foam or materials that may release formaldehyde beyond standard limits of authorities having jurisdiction.
5. Pitch polymer DPC
6. Materials which generally comprise mineral fibers, either man-made or naturally occurring, which have a diameter of three (3) microns or less and a length of 200 microns or less, or which contain any fibers not sealed, encapsulated, or otherwise stabilized to ensure that fiber migration is prevented. Products that may contain these fibers include insulation, fire protection and air filters. For all mineral wool insulation products, test evidence must be available and produced confirming that the materials fulfill all statutory requirements and consequently are not classified as a possible human carcinogen.
7. Materials in which CFCs, HCFCs or HFAs have been used as a blowing agent
8. The use of a species of hardwood from the tropical rainforest is not permitted unless it is obtained from sustainable resources.
9. High alumina cement in structural elements
10. Wood wool slabs in permanent formwork to concrete or in structural elements.
11. Calcium chloride in admixtures for use in reinforced concrete
12. Chlorofluorocarbons or any goods and/or material containing the same
13. Polychlorinated biphenyls or any goods and/or materials containing the same.
14. Calcium silicate bricks or tiles.
15. Pesticides, biocides and carcinogens as listed by recognized authorities such as the Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC)

1.6 SUSTAINABLE SOURCES OF WOOD

1. A minimum 50 percent of wood-based materials and products shall be certified in accordance with the Forest Stewardship Council's (FSC) Principles and Criteria, for wood building components. These components include, but are not limited to:
 - a. Structural framing
 - b. General dimensional framing
 - c. Flooring
 - d. Sub-Flooring
 - e. Wood doors
 - f. Wood finishes
2. Only include materials permanently installed in the project
3. For FSC products, provide certificates of chain-of-custody (COC) signed by manufacturers certifying materials and products specified are made from certified wood obtained from forests certified by a Forest Stewardship Council accredited certification body. Provide invoices with the following information: each wood product identified on a line item basis; FSC products identified on a line item basis; all the line items must have dollar values and vendor COC certificate number must be shown for any item with FSC content. Include evidence mill is certified for chain-of-custody by an FSC-accredited certification body.

B. Technologies and Strategies

1. Establish a project goal for FSC certified wood products and identify suppliers that can achieve this goal.
2. During construction, ensure that the FSC certified wood products are installed.
 - a. Quantify the total percentage of installed FSC certified wood products
3. Do NOT provide tropical hardwoods, unless FSC certified
4. Provide plywood and MDF made from softwood or temperate hardwoods from sustainable sources, or from rapidly renewable materials.

C. For non-FSC certified wood, provide wood and wood based products applying to one or more of the following criteria:

1. Harvested from a known certifiable forest
2. Harvested from a forest certified sustainable by one of the following:
 - a. Sustainable Forestry Initiative (SFI)
 - b. AM Tree Farm
 - c. Canadian Standards Association (CSA) International, Standard Z809-02
 - d. Certified Forest Products Council (CFPC)
3. Harvested from a well-managed local forest, using industry recognized sustainable methods.
4. Made from LEED credit recognized rapidly renewable materials
5. Made with LEED credit recognized recycled materials
6. Harvested, milled and/or fabricated within 500 miles of the Project Site, in accordance with LEED credit criteria
7. Manufactured using no added urea-formaldehyde resins, in accordance with LEED credit criteria
8. Finished using no or low VOC coatings in accordance with LEED credit requirements.

1.7 SKILLED PERSONNEL

- A. Execute the work using persons skilled in the processes to be adopted. Where requested, provide such documentation necessary to demonstrate an individual's ability to carry out the work to which he has been assigned.

1.8 SUITABILITY OF STRUCTURE

- A. Before commencing any part or element of the Work, survey the structure, checking lines, level and fixing points and report immediately to the Architect if the structure is considered to be unsuitable. If the structure is unsuitable, propose remedial action.

1.9 COMPATIBILITY

- A. Ensure that all materials and processes employed in the works are compatible with each other and meet the current requirements of the relevant American Standards and Codes of Practice. All materials and associated components shall be stored in a clean, dry area, in accordance with the manufacturer's written recommendations.

1.10 MANUFACTURER'S INSTRUCTIONS

- A. Where proprietary systems are specified and included in the works, ensure that the method of building or installing is strictly in accordance with the manufacturer's printed instructions and that copies of all such documentation are supplied to the Architect prior to commencement of the works.

1.11 VISUAL INSPECTION

- A. All finished surfaces shall be subject to visual inspection and be acceptable to the Architect.

1.12 SUPPLIES

- A. Be responsible for all materials, components and equipment supplied or manufactured by sub-contractors or suppliers, until the end of the warranty period defined in the Contract.

1.13 COVERING UP

- A. No work shall be covered up without observation performed by the Architect. Afford reasonable notice and full opportunity for the examination and measurement of Work that is about to be covered up.

1.14 CUTTING, ETC.

- A. Cutting of metal products shall be straight and free from burrs and each joint shall be flush, without gaps or imperfections. If base metal is exposed, the surface shall be protected to the same level of protection as stated in the Specifications.

1.15 DETERIORATION

- A. Each material shall be treated/selected to prevent damage from all possible combinations of atmospheric deterioration, corrosion, wet rot, dry rot, fungi, mold and all other deleterious effects, including atmospheric pollution and pH factor of the adjacent elements.
- B. Ensure that no chemical or electrolytic action takes place where dissimilar metals and/or materials are used together.
- C. No material shall discolor, crack or otherwise be damaged by the worst possible combination of environmental conditions identified herein.

- D. With materials subject to surface treatment, special attention shall be given to the substrate to ensure that the preparation is compatible with the surface treatment.
- E. Ensure that all superficial dust and friable materials are removed and that adequate protection is provided during the process of the surface treatment and finishes to prevent contamination by dust and other debris.
- F. Materials used in the manufacture of the works shall not be liable to infestation attack by microorganisms, fungi, insects or other vermin, nor provide harborage for same.

1.16 LINE AND LEVEL

- A. Each component shall be installed plumb or horizontal and shall line up with adjacent components, in each direction, taking account allowable tolerances.

1.17 METHOD STATEMENTS

- A. Provide a detailed method statement describing the sequence and methods to be employed in carrying out this Work identifying proposed solutions regarding workmanship that affects the fabrication, holding storing and handling, setting out, site assembly, bolting joining and welding of components and the protection of the metalwork against corrosion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014410

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 Section:
 - 1. Division 01 Section "Execution" for progress cleaning requirements
 - 2. See Divisions 02 through 32 for temporary heat, ventilation and humidity requirements for products in those Sections.

1.2 DEFINITIONS

- A. Permanent Enclosure: As determined by Owner, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water Service: When water from Owner's existing water system is available for use, it may be used without metering at the Owner's representative's discretion and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service: When electric power from Owner's existing system is available for use, it may be used without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

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: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Lumber and plywood: Comply with requirements in Division 06 Section "Rough Carpentry"
- B. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular type panels with tapered edges. Comply with ASTM C 36/C 36M
- C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool or rock wool; with maximum flame-spread and smoke developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Provide a job trailer for the duration of the project. Provide no later than 5 working days from contract acceptance. Location to be determined by HBC project manager and/or HBC project coordinator. The trailer (approximately 10' x 40') shall be of sufficient size to conduct sit-down meetings with approximately 12 attendees and have an office in both ends. Utility hook-ups, cost and metering (including telephone for HBC trailer office) will be part of this project. A representative from Hannaford Bros. shall occupy one office.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction
- C. Store Equipment: Use of Owner's Equipment not allowed

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to sewer system indicated as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Final Completion, restore these facilities to condition existing before initial use.
 - 1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- E. Sanitary Facilities: Provide temporary toilets, wash 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.

3.3 Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

- A. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

- B. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- 3.4 Electric Power Service: Use of Owner's existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to Owner.
- A. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead, unless otherwise indicated. Connect temporary service to Owner's existing power source, as directed by Owner.
 - B. 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.
 - C. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line for each field office.
 - 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine.
 - 2. Provide superintendent with cellular telephone with voicemail
 - D. Electronic Communication Service: Provide a computer with electronic communication service, including electronic mail and internet access in field office. Provide internet access in Owner's representatives' office in field office.
- 3.5 SUPPORT FACILITIES INSTALLATION
- A. General: Comply with the following:
 - 1. Provide incombustible construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
 - 2. Maintain support facilities until near Final Completion. Remove before Substantial Completion. Personnel remaining after Final Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
 - 3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

3.6 Parking:

- A. Use designated areas of Owner's existing parking areas for construction personnel.
 - 1. Provide temporary, directional signs for construction personnel and visitors.
 - 2. Maintain and touchup signs so they are legible at all times.
- B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements. Provide waste disposal for all debris created through the construction of this facility, including all Hannaford Bros. Co. (HBC) supplied equipment packaging and HBC sub-contractor debris (i.e., signage, controls, refrigeration, security). One dumpster will be on site until 2 weeks after Grand Opening.
- C. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

3.7 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. 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.
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings (requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent).
- 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.
- D. Hannaford Bros. will provide security during the night shift to maintain passage through one door opening at a time (including overhead doors). The remainder of the building during the night shift will remain secured.
- E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- 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 not complete, insulate temporary enclosures.
 - 2. Materials for exterior work shall be stored neatly behind barricade areas and/or in storage container.

- G. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate occupied areas from fumes and noise. Construction barricades from the Boston Barricade Company (866-866-0925) shall be used on this project. An equivalent barricade will be acceptable if submitted and approved by the HBC project manager. White poly will extend from the top of the barricade wall to the ceiling grid or roof deck, whichever is needed to control dust. Contractor shall carry an allowance of 150' lineal feet of barricade.
- H. Any shelving and/or product below overhead work or near construction activities will be protected from dust and debris. The store will be clean and functional by 7:00 am daily. The use of sweeping compound, portable exhaust fans, water/wet vac combinations, tented enclosures with the full height barricades and vacuum gypsum sanders are to be used as needed to control dust. Construction activities on the sales floor must be completed, equipment removed and area cleaned of construction dust or debris, to insure that the store will be functional by 7:00 am daily. Electric powered saws for cutting concrete are permitted. Hydraulic powered saws with the power source outside (if non-electric) are permitted. The use of internal-combustion engines inside the building is not permitted unless emissions certification is provided, Co2 monitoring is in effect, and the work area is completely tented and ventilated.
- I. 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.
 - 1. Prohibit smoking in construction areas.
 - 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.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.8 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.
 - 2. Contractor to supply and maintain rugs to cover or create a transition over an uneven floor, starting at 1/8". Rugs are to be kept clean daily to provide a clean and dust free area. Safety tape is to be installed along edge of all construction rugs and exposed VCT edges.

- 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 Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 015720 - CONSTRUCTION INDOOR AIR QUALITY

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Sections include the following"
 - 1. Section 018115 Sustainable Design Requirements Summary

1.2 SUBMITTALS

- A. Construction IAQ Management Plan highlighting the five requirements of the SMACNA IAQ Guideline for Occupied Buildings under Construction, 1995, Chapter 3, "Control Measures"
- B. Cut sheets of filtration media used during construction and installed immediately prior to occupancy with MERV values highlights.

1.3 IAQ MANAGEMENT GOALS

- A. Owner has established that this Project shall prevent indoor air quality problems resulting from the construction process, to sustain long-term installer and occupant health and comfort.
- B. Protect the ventilation system components during construction and cleanup of contaminated components after construction is complete
- C. Control sources of potential IAQ pollutants by controlling selection of materials and processes used in project construction.
- D. With regard to these goals the Contractor shall develop, for Owner and Architect's review, an IAQ Management Plan for this Project.

1.4 IAQ MANAGEMENT PLAN

- A. Develop a Draft Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:
 - 1. During Construction: Meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Building Construction 1995, Chapter 3;
 - a. The SMACNA IAQ Guidelines for Occupied Buildings under construction provides and overview of air pollution associated with construction, control measures, construction process management, quality control, communicating with occupants and case studies. These guidelines can be accessed at www.smacna.org. Chapter 3 of the SMACNA Guidelines recommends Control Measures in five (5) areas:

- i. HVAC protection
 - ii. Source control
 - iii. Pathway interruption
 - iv. Housekeeping
 - v. Scheduling.
- b. HVAC Protection: Shut down the return side of the HVAC system whenever possible during heavy construction. If the system must remain operational during construction, as a minimum include the following applicable strategies:
- i. Fit the return side of each HVAC system with temporary filters, MERV 8 or better, as determined by ASHRAE 52.2-1999;
 - ii. Isolate the return side of each HVAC system from the surrounding environment to greatest extent possible, (e.g place all ceiling tile for ceiling plenum; repair all ducts and air handler leaks;
 - iii. Damper off the return system in the heaviest work areas and seal the return system openings with plastic;
 - iv. Upgrade the filter efficiency, where major loading is expected to affect operating HVAC system;
 - v. Clean permanent return air ductwork per National Air Duct Cleaning Association standards upon completion of all construction and finish and décor installation work;
 - vi. Install new clean media just prior to substantial completion and occupancy with a Minimum Efficiency Reporting Value (MERV) 8, as determined by ASHRAE 52.2-1999.
- c. Source Control: Propose the substitution of non-toxic formulations of materials that are generally the responsibility of the Contractor, such as caulks, sealants and cleaning products.
- d. Pathway Interruptions: Prevent contamination of clean spaces. Include the following strategies:
- i. Use 100 percent outside air ventilation (when the outside air temperatures are between 60° F and 80° F and relative humidity between 30 percent and 60 percent, with air exhausted directly to the outside during installation of finishes, décor and other VOC emitting materials.
 - ii. Erect dust-tight barriers between work areas and between the inside and outside of the building envelope to prevent unwanted airflow from dirty spaces/areas to clean spaces/areas.
- e. Housekeeping: Reduce construction contamination in the building, prior to occupancy, through HVAC and regular spacing cleaning activities.
- i. Store building materials in a weather tight, clean area prior to unpacking for installation.
 - ii. Check for damage to stored and installed materials, assemblies and HVAC from high humidity.
 - iii. Clean all air coils, air filters and fans before testing, balancing and adjusting procedures are performed.

- f. Scheduling: Specify construction sequencing, to reduce absorption of VOC's by materials that act as sinks or contaminant sources. Complete application of wet and odor emitting materials such as sealants, paints, and coatings before installing of sink materials such as ceiling tiles, insulation, gypsum products, carpet material, and fabric covered furnishings are installed or placed.
 2. Protect stored on-site or installed absorptive materials from exposure to moisture through precipitation, plumbing leaks or condensation from the HVAC systems or condensation due to atmospheric conditions, to prevent microbial contamination.
- B. Draft IAQ Management Plan Review Meeting. Once the Owner, Contractor and Architect have reviewed the Draft IAQ Management Plan and prior to construction at the site, schedule and conduct a meeting to review the Draft IAQ Management Plan and discuss procedures, schedules and specific requirements for IAQ during the construction and pre-construction phases of the building. Discuss coordination and interface between Contractor and other construction activities. Identify and resolve problems with compliance to the requirements. Record minutes of the meeting and identify all conclusions reached and matters requiring further resolution.
1. Attendees: The Contractor and related Contractor personnel associated with the work of this section, including personnel to be in charge of the IAQ Management Program, Architect, Owner and such additional personnel as the Architect or Owner deem appropriate.
- C. Final IAQ Management Plan: Make revisions to the Draft IAQ Management Plan agreed upon during the Review Meeting identified in paragraph B, above and incorporate resolutions agreed to be subsequent to the review Meeting. Submit the revised plan to the Owner and Architect for approval within ten (10) calendar days of the Review Meeting.
- 1.5 IMPLEMENTATION OF IAQ MANAGEMENT PLAN
- A. Manager: Contractor shall be responsible for instructing workers and overseeing the IAQ Management Plan for the Project.
 - B. Progress Meetings: Construction related IAQ procedures shall be included in the construction progress meeting agendas.
 - C. Preinstallation Meeting: Construction related IAQ procedures shall be included in the construction preinstallation meeting agendas.
 - D. Distribution: Contractor shall distribute copies of the IAQ Management Plan to the Job Site Foreman, each Subcontractor, the Owner and Architect
 - E. Instruction: Contractor shall provide on-site instruction of IAQ procedures and ensure that each participant in the construction process understands the importance of each IAQ Management Plan goal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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 Section:
 - 1. Division 01 Section "Closeout Procedures" for requests for submitting warranties for Contract closeout
 - 2. Section 018115 Sustainable Design Requirements Summary
- C. See Division 02 through 32 Sections for specific requirements for warranties on products and installations specified to be warranted.

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, which is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, 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. Substitutions: Changes in products, materials, equipment and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 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 Request Form: Use CSI Form 13.1A (or similar document)
 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution..
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - d. Product Data, including drawings and descriptions of products and fabrications and installation procedures.
 - e. Samples, where applicable or requested
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - i. Detailed comparison of Contractor's Construction Schedule using proposed substitution 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 lack of availability or delays in delivery.
 - j. Cost information, including a proposal of changes, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - l. 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 5 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution request within 10 days of receipt of request, or 5 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution request within time allocated.

- B. Comparable Product Requests: Submit three copies of each request for consideration. Identify project or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 5 days of receipt of a comparable product request. Architect will notify Contractor of acceptance or rejection of proposed substitution request within 10 days of receipt of request, or 5 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution request within time allocated.

1.4 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.

1.5 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.
- B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
 2. Store materials in a manner that will not endanger Project structure.
 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 4. Store cementitious products and materials on elevated platforms.
 5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.6 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: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. Refer to Divisions 02 through 16 for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

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 not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.

6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements..
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturer's names, provide a product by one of the manufacturers listed that complies with requirements.
5. Product Options: Where Specifications indicate that sizes, profiles, dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
6. Visual Matching Specification: Where Specifications require matching an established sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Part 2 "Product Substitutions" for proposal of product.
7. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items,
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

- A. Timing: Owner will consider requests for substitution if received within 30 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect
- B. Conditions: Owner 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.
 1. 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.

2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.

2.3 COMPARABLE PRODUCTS

A. Conditions: Owner will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Owner will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
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.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. General installation of products
 - 2. Progress cleaning.
 - 3. Starting and adjusting.
 - 4. Protection of installed construction.
 - 5. Correction of the Work.
- B. Maintain the job site in a safe, clean manner at all times. A daily clean up shall be performed as a minimum effort to keep work areas clean and organized.
- C. Related Sections:
 - 1. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 2. Section 018115 Sustainable Design Requirements Summary

1.2 SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities and other construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate

and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 2. Furnish location data for work related to Project that must be performed by public utilities service Project site.
- C. Acceptance of Conditions: 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. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 4. 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 Owner. Include a detailed description of problems encountered, together with recommendations for changing the Contract Documents. Submit request on RFI section of Owner's project extranet.

3.3 INSTALLATION

- A. General: 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.
- 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 the best possible results. 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.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. 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 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.

- 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 in Finished Areas: 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.
- 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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.7 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. See Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.3 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. If required, submit locations to an engineer to provide load calculations.
 - 1. 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

- B. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related 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
- C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces 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.

1.4 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.

- B. 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.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. 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 interruption to occupied areas.

3.3 PERFORMANCE

- 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. 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.
- C. All slab cuts for underslab plumbing, electrical and refrigeration shall be made with an electric saw and vacuum attachment to minimize dust. Wet spray may also become necessary for slab cuts and jackhammer operations. A wet-vac shall be utilized in these situations. If air-borne dust does get on product, Contractor may be subject to damage claims for the store. Noise is also a concern. Schedule demolition activities at night. No jack hammer operation can occur during the day due to excessive noise. In addition to plumbing and electrical slab cuts as needed, refrigeration trenches for underground refrigeration lines noted on the "R" drawings will be included in this contract, as well as the removal and disposal of concrete waste, recompacted fill and doweled concrete slab. All trenching to be left open shall be covered with 1/4" thick steel plate with beveled edges, 6" minimum bearing. Plates are to be fastened with countersunk bolts at all four corners. Industrial entrance carpets are to be placed over these plates and taped to the floor with high-visibility tape.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finish 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 Division 31 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.
- D. 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 possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate 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.
 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.
 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.
- E. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. The work of this Section includes a complete program for implementation of waste management controls and systems for the duration of the Work.

1.2 INTENT

A. General Intent

1. The Owner has established that this Project shall generate the least amount of waste practical and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
2. Of the waste that is generated, as much of the waste materials as is economically feasible shall be reused, salvaged or recycled.
 - a. Waste disposal in landfills shall be minimized to the greatest extent practical
3. A minimum of 75% of total Project construction waste (by weight) shall be diverted from landfill. Excavated soil and land-clearing debris do not count toward MRc2. The following waste categories are likely candidates to be included in the diversion plan for this project.
 - a. Concrete
 - b. Metals (e.g., banding, stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, brass, bronze)
 - c. Cardboard, packaging
 - d. Clean dimensional wood
 - e. Drywall
 - f. Carpet & Pad
4. General Contractor is responsible for enforcing all sub-contractors, including Owner sub-contractors, to complying with these requirements.

1.3 DEFINITIONS

- A. Waste Reduction: Construction practices that achieve the most efficient use of resource and materials; uses water efficiently; avoids practices such as over-packaging, improper storage, ordering errors, poor planning, breakage, mishandling and contamination.

- B. Construction, Demolition and Land clearing (CDL) materials: Waste and recyclable generated from construction, land clearing (e.g., vegetation but not soils), renovation, demolition or deconstruction of existing structures. CDL does not include hazardous or toxic materials
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycling: The collection, reprocessing, marketing and use of materials that were recovered from the solid waste stream and diverted from landfill disposal or incineration. Recyclable materials include, but are not limited to, the following:
 - 1. Metals, Ferrous (iron, steel, stainless steel, galvanized steel) and non-ferrous (copper, brass, bronze, aluminum) types and containers made from metals such as pails, buckets and beverage cans
 - 2. Asphaltic concrete paving
 - 3. Concrete
 - 4. Gypsum wallboard
 - 5. Paper products such as generated from field office activities and clean corrugated packaging cardboard.
 - 6. Wood products, including untreated dimensional lumber, plywood, oriented strand board, hardboard, particleboard and crates and pallets made from wood products.
 - 7. Brick and stone masonry
 - 8. Carpet and padding
 - 9. Plastics and containers made from plastics such as pails, buckets and beverage bottles
 - 10. Wire and cable
 - 11. Glass: glass beverage containers, window and mirror glass
 - 12. Clean and uncontaminated excavated soils not intended for other on-site use.
 - 13. Stumps, trees, and green materials removed as a part of land clearing operations
- E. Non-Recyclable Materials: Construction and demolition materials not capable of being reused or processed for recycling, exclusive of the recyclable materials listed above
- F. Hazardous Materials: Construction and demolition materials that are regulated for disposal by local, city, country, state or Federal authorities
- G. Reuse or Salvage: Products that could have been disposed of as solid waste, having completed its life cycle as a consumer item, but otherwise is refurbished for reuse without substantial alteration of its form. Examples of refurbished products include repaired office furniture and reconditioned carpet.

1.4 PERFORMANCE REQUIREMENTS

- 1. General: Achieve end-of-Project rates for salvage/recycling of 75% by weight of total non-hazardous solid waste generated by the Work.
- 2. Reduce waste by minimizing factors that contribute to generation of on-site waste, such as use of pre-engineered wood instead of dimensional lumber that requires end-cuts.
- 3. Use reasonable and legal means to divert a minimum of 75% of construction and demolition materials from landfills and incinerators by recycling or reuse through a

Contractor developed, and CM reviewed, Construction Waste Management and Recycling program.

1.5 SUBMITTALS

- A. Contractor's Plan for Solid Waste Management and Recycling: Submit the proposed solid waste management and recycling plan for a minimum of 75% diversion prior to the start of Work. Include the following:
1. Identification of Contractor's staff responsible for enforcing construction waste management and recycling
 2. Actions that will be taken to reduce solid waste generation
 3. Description of the specific methods to be used in recycling/reuse of the various construction and demolition materials generated, including the areas and equipment to be used for processing, sorting and temporary storage of materials, and construction demolition materials
 4. Characterization, including estimated types and quantities of the construction and demolition materials to be generated. Include percentages of recyclable and non recyclable materials
 5. List of specific construction and demolition materials that will be salvaged for resale, salvaged and reused, or recycled.
 6. Name(s) of landfill and incinerators to be used and the estimated costs for use, for construction and demolition materials that are unable to be recycled or reused
 7. Identification of local and regional reuse programs, including non-profit organizations such as schools, local housing agencies, and organizations that accept used and excess construction materials such as materials exchange networks and Habitat for Humanity
 8. Identification of local recycling facilities that will accept construction and demolition materials.
 9. Identification of construction and demolition materials that cannot be recycled/resued with an explanation or justification.
 10. Anticipated net cost savings determined by subtracting Contractor program management costs and the cost of disposal from the revenue generated by sale of the construction and demolition materials and avoided landfill and incineration costs.
- B. Contractor's Report of Solid Waste Management and Recycling: With each Application for Payment submit a Report of Solid Waste Management and Recycling, demonstrating a minimum of 75% diversion. Attach manifests, weight tickets, receipts and invoices. Organize and maintain records to document the following:
1. Quantity of materials generated, for each material recycled, reused or salvaged. Report quantities in tons if scales are available at recycling facilities. Otherwise, report in cubic yards or number of items reused or recycled.
 2. Quantity of materials diverted through sale, reuse, or recycling, in tons, cubic yards, or number of items.
 3. Quantity of materials disposed by landfill or incineration. Report in tons or cubic yards.
 4. Name and location of each facility accepting the materials, including
 - a. Types of materials accepted
 - b. Net weights of each type in tons or cubic yards
 - c. Date of acceptance

5. Transportation costs for removal of materials from job site
 6. Amount of money paid or received for the recycled, reused, or salvaged materials
 7. Net total cost or savings or recycling, reusing, or salvaging materials
- C. Project Closeout: Upon project completion, submit the cumulative Report of Solid Waste Management and Recycling, from inception to completion, to the Owner and Architect
- D. QUALITY ASSURANCE
- E. Construction Waste Management and Recycling: Prepare a Solid Waste Management and Recycling Plan that minimizes waste and diverts construction and demolition materials from landfills and incinerators by facilitating their reuse or recycling.
1. Name the solid waste material and recycling processors who will accept the construction and demolition materials, the condition of the construction and demolition materials required by the solid waste material and recycling processors, the method proposed to provide the construction and demolition materials in suitable condition and in a quantity acceptable to the disposal sites and solid waste material and recycling processors that will receive them, and any impact on the project schedule.
 2. Contractor is responsible for implementation of each special program involving rebates or similar incentives related to the recycling of waste.
 - a. Revenues or other savings obtained from sale, reuse and recycling operations will accrue to the Contractor.
- F. Disposal Sites and Solid Waste Material Recycling Processors: Use only facilities that can legally accept construction and demolition material for disposal, recycling and waste processing issued by the jurisdiction in which they are located.
- G. Pre-construction Meeting: Prior to beginning site preparation, schedule and conduct a meeting to review the Contractor's Waste Management and Recycling Plan.
1. Meeting shall include the Contractor, the Architect of Record and its subconsultants, the CM and each subcontractor or supplier whose work will interface with the program.
 2. Agenda shall include a discussion of procedures, schedules and specific requirements for construction and demolition materials, sale, reuse, recycling and disposal.
 3. Make revisions to the Plan that are agreed to as a result of the meeting and submit the revised Plan and the meeting minutes to the CM for his record

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. General: For the duration of the Work, implement and maintain construction waste management and recycling. During the execution of the work, encourage the practice of efficient waste reduction when sizing, cutting and installing products and materials.

1. Distribution: Distribute copies of the solid waste management and recycling plan to the Job Site Foreman, each subcontractor, the CM and the Architect of Record
2. Manager: Contractor shall be responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.
3. Hazardous Wastes: Existing hazardous wastes are to have been removed prior to the start of demolition.
 - a. Contractor furnished hazardous construction waste and unforeseen hazardous wastes shall be separated, stored, and disposed of according to local regulations of authorities having jurisdiction, and as directed by the CM.

B. Recycling

1. Procedures: Separate recyclable waste from other waste materials, trash and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
2. Recycling Demolition Waste: Asphaltic concrete paving, concrete, masonry, wood materials, metals, asphalt shingle roofing, gypsum board, acoustical ceiling panels and tile, carpet and pad, equipment, plumbing fixtures, piping, lighting fixtures, electrical devices and conduit
3. Recycling Construction Waste: Packaging, site-clearing wastes, wood materials and gypsum board
 - a. Recycle paper and beverage containers used by on-site workers.
4. Disposal of Waste: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to local jurisdiction.
 - a. Burning: Do not burn waste materials
 - b. Disposal: Transport waste materials off Owner's property and legally dispose of them.
5. Metal, including but not limited to aluminum stairs, structural beams and sections, and reinforcing steel shall be recycled.
6. Wood that is not painted and does not contain preservatives (i.e., creosote, arsenic, and chromium-containing preservatives) shall be segregated and recycled.
7. Trees and brush removed during the demolition shall be chipped and stockpiled on-site and cut for firewood and lumber and removed from the site.
8. Salvaging Demolition Waste
9. Salvaged Items for Reuse in the work: Clean, pack or crate items, identify container contents, protect and store items in a secure area until installation.
 - a. Install salvaged items to comply with installation requirements for new materials and equipment
 - b. Provide connections, supports and miscellaneous materials necessary to make items functional for use indicated.
10. Salvaged Items for Sale and Donation: Note permitted on Project site. Salvaged items for Owner's use: Clean, pack or crate items, identify container contents, protect and store items in a secure area until installation.

- C. Transportation: Arrange for the regular collection, transport from the site, and delivery of the construction wastes and materials to the designated recyclers, and waste material processors and disposal sites, using waste haulers that are permitted by local authorities to transport construction and demolition materials.
- D. 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. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
- E. Separation Facilities: Provide on-site instruction of appropriate separation, handling separation, and recycling, salvage, reuse and return methods to be used by each party at the appropriate stages of the Work.
 - 1. Provide and designate an area for the separation of construction and demolition materials for reuse and recycling.
 - a. Locate the area so that non-recyclable materials will not contaminate materials to be reused or recycled.
 - 2. Provide containers and bins in the designated area to facilitate separation, storage and handling which are clearly and appropriately marked.
 - 3. Cut all items to lengths and sizes to fit within the containers or bins provided.
 - 4. Where there is sufficient quantity of a specific recyclable materials type (for example: salvaged metal doors and frames or duct work) make arrangements for items to be bundled, banded or tied, and stack in a designated location for a special pick up.
 - 5. Maintain the separation facilities in an orderly condition to prevent contaminants of materials placed therein and to maximize reuse and recyclability of materials
 - 6. Separate construction and demolition materials at the project site by one of the following methods:
 - a. Source Separated Method: Construction and demolition materials, that are reusable and recyclable, are separated from non-recyclable materials and sorted into appropriately marked separated containers or bins and then transported to the designated recycling facility for further processing. Non-recycled materials are transported to a landfill or incinerator. Mark recycling containers in English, Spanish and other languages as required.
 - b. Co-Mingled Method: All construction and demolition materials are placed into containers or bins and then transported to a recycling facility where recyclable and salvageable materials are removed, sorted, and processed, recovered, and the remaining debris is transported to a landfill or incinerator.

END OF SECTION 017419

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FORM CWM-5: COST/REVENUE ANALYSIS OF CONSTRUCTION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A x B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

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. Inspection procedures
 2. Warranties.
 3. Punchlist Items
 4. Final cleaning.
- B. Related Sections:
1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 2. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 3. Divisions 02 through 32 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
1. Advise Owner of pending insurance changeover requirements.
 2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 4. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographs and negatives, damage or settlement surveys, property surveys, and similar final record information.
 5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 7. Complete startup testing of systems.
 8. Submit test/adjust/balance records.
 9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 10. Advise Owner of changeover in heat and other utilities.

11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner will prepare the Certificate for payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
2. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner 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. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit two copies 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. Use CSI Form 14.1A

1. Organize list of spaces in sequential order, starting with exterior areas first, then proceeding around store in a counterclockwise direction..
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

1.5 WARRANTIES

A. Submittal Time: Submit written warranties on request of Owner for designated portions of the Work where commencement of warranties other than date of Final Completion is indicated.

- B. Except as longer terms are specified under the various Technical Sections of the Specifications, and barring any conflicting provisions in any Conditions of the Contract, all work on the Project shall be guaranteed against defects in materials and/or workmanship for a period of one (1) year commencing on the date the project, or portion thereof, is accepted for beneficial use, and occupancy for the purpose intended.
- C. During the warranty period, the following trades will provide 24 hour per day warranty service with a four hour response time. Names and 24 hour phone numbers for emergency warranty service shall be provided to owner prior to completion:
 - 1. Automatic Entrance Doors
 - 2. Refrigeration
 - 3. HVAC
 - 4. Plumbing
 - 5. Roofing
 - 6. Sprinkler System
 - 7. Electrical
- D. Any such defects occurring within such period shall be promptly corrected without additional charge to the Owner.
- E. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 - 1. Use cleaning products that meet Green Seal 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. General: Provide 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 Final Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Replace parts subject to unusual operating conditions.

- o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage system. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation manuals for systems, subsystems, and equipment.
 - 2. Maintenance manuals for the care and maintenance of systems and equipment.
- B. Related Sections:
 - 1. Divisions 02 through 32 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.2 SUBMITTALS

- A. Manual: Submit one copy of each manual in final form at least 10 days before final inspection. Architect will return copy with comments within 5 days after final inspection.
 - 1. Correct or modify each manual to comply with Owner's and Commissioning Agent's comments. Submit 2 copies of each corrected manual within 10 days of receipt of Owner's and Commissioning Agent's comments.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.
- B. Title page
 - 1. Subject matter included in manual
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address and telephone number for Contractor.
 - 6. Name and contact information for Architect.
 - 7. Name and contact information for Commissioning Agent.
 - 8. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 - 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.
- B. Descriptions: Include the following:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.

- C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal and weekend operating instructions; and required sequences for electric or electronic systems.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment.
- D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions, and demonstration and training videotape if available, that detail essential maintenance procedures.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
- D. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

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.
- B. Related Sections:
 - 1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 2. Divisions 02 through 32 Sections for specific requirements for project record documents of the Work in those Sections.

1.2 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Final Submittal: Submit one of marked-up record prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of black-line white prints of the Contract Drawings and Shop Drawings.
 - 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 prepare the 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. Record data as soon as possible after obtaining it.

- c. Record and check the markup before enclosing concealed installations.
 2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 4. Note RFI 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 and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. Note related Change Orders and record Drawings where applicable.

2.3 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples 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.

END OF SECTION 017839

SECTION 018115 - SUSTAINABLE DESIGN REQUIREMENTS SUMMARY

PART 1 GENERAL

1.1 SUMMARY

- A. Work of this Section consists of general requirements and procedures for compliance with sustainable design practices.
 - 1. Participate in promoting efforts of Owner and Architect to create a sustainable building design.
 - 2. Adhere to Contract Document referenced sustainable criteria to guarantee environmental performance of the project.
 - 3. Sustainable requirements should be followed in conjunction with requirements in the Sections for individual construction activities. Any discrepancies between the two require notification of the Architect and the Architect's approval of the resolution.

- B. Related Documents and Sections: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections include, but is not limited to the following
 - 1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and General Requirements, Division 01 Specification Sections.
 - 2 Divisions 01 through 32 Sections for requirements specific to the Work of each of those Sections. These requirements may or may not include reference to sustainable practices.

1.2 REFERENCED ORGANIZATIONS

- A. BAAQMD
Bay Area Air Quality Management District, Reg. 8, Rule 51

(415) 771-6000
www.baaqmd.gov/regs/rg0851.pdf

- B. BIFMA
Business and Institutional Manufacturer's Association (The)
www.bifma.org

- C. CARB
California Air Resources Board
www.arb.ca.gov

- D. CFPC
Certified Forest Products Council
(503) 224-2205
www.certifiedwood.org

- E. CRI
Carpet & Rug Institute (The)
(800) 882-8846
www.carpet-rug.com

- F. CRS
Center for Resource Solutions
www.resource-solutions.org
- G. EPA
U.S. Environmental Pollution Agency
www.epa.gov
- H. FSC
Forest Stewardship Council
(202) 342-0413
www.fscus.org
- I. GEI
Greenguard Environmental Institute
www.greenguard.org
- J. GS
Green Seal
(202) 872-6400
www.greenseal.org
- K. IESNA
Illuminating Engineering Society of North America
(212) 248-5000
www.iesna.org
- L. RFCI
Resilient Floor Covering Institute
www.rfci.com
- M. SCAQMD
South Coast Air Quality Management District Rule #1168
(909) 396-2000
www.aqmd.gov/rules/html/r1168.html
- N. SCS
Scientific Certification Systems
Forest Conservation Program' (FCP)
(510) 452-8000
www.scscertified.com
- O. SFI
Sustainable Forestry Initiative
Certified (Sustainably Sourced) Lumber
<http://www.aboutsfi.org/core.asp>
- P. USGBC
US Green Building Council
(202) 828-7422
www.usgbc.org

1.3 REFERENCED STANDARDS

- A. ANSI – Most recent edition
 - 1. ANSI/ASHRAE 52.2 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size
 - 2. ANSI/ASTM-E779-03 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
- B. ASHRAE – Most recent edition
 - 1. ASHRAE 55–2004 -- Thermal Environmental Conditions for Human Occupancy
 - 2. ASHRAE - Advanced Energy Design Guide for Small Office Buildings 2004
 - 3. ASHRAE 62.1-2004 – Ventilation for Acceptable Indoor Air Quality
 - 4. ASHRAE 90.1-2004 -- Energy Standard for Buildings Except Low-Rise Residential
- C. ASTM
 - 1. ASTM E1980-1 – Standard Practice for Calculation of Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
 - 2. ASTM E1903-97 – Phase II Environmental Site Assessment
- D. BIFMA
 - 1. BIFMA Sustainability Guidelines
- E. CA
 - 1. California Dept of Health Services Standard Practice
 - 2. Residential Manual for Compliance with California’s 2001 Energy Efficiency Standards, Chapter 4
- F. CIBSE
 - 1. Applications Manual 10: 2005, Natural Ventilation in Non-Domestic Buildings
- G. CRI
 - 1. Carpet & Rug Institute Green Label Plus Testing Program
- H. EPA
 - 1. Energy Policy Act (EPAct) of 1992, Fixture Flow Requirements
 - 2. EPA - Brownfields Definition
 - 3. EPA 840-B-92-002, Jan 1993 – Guidance Specifying Management Measures for Sources of Non-Point Pollution in Coastal Waters
 - 4. EPA 832-R-92-005 – Storm Water Management for Construction Activities, Chapter 3
 - 5. EPA PB90200288 – Compendium of Methods for the Determination of Air Pollutants in Indoor Air
- I. FEMA
 - 1. 100-Year Flood Definition
- J. FSC

- 1. Principles and Criteria
- K. FWS
 - 1. Endangered Species List
- L. Green-e
 - 1. Electricity Product Certification Requirements
- M. GreenGuard
 - 1. Greenguard Certification Program
- N. Green Seal
 - 1. Standard GS-11 – Architectural Paints, Coating and Primers
 - 2. Standard GS-36 – Commercial Adhesives
 - 3. GStandard GS-03 – Anti-corrosive Paints
- O. IPMVP
 - 1. Volume III: Concepts and Options for Determining Energy Savings in New Construction, April 2003
- P. ISO
 - 1. ISO 14021 –Environmental Labels and Declarations
- Q. NBI
 - 1. Advanced Buildings Benchmark Version 1.1
- R. NMFS
 - 1. Endangered Marine Species List
- S. RFCI
 - 1. Floorscore
- T. SCAQMD
 - 1. Rule #1113 – Architectural Coatings
 - 2. Rule #1168 – Adhesives and Sealants
- U. SMACNA
 - 1. IAQ Guidelines for Occupied Buildings Under Construction
- V. The Carbon Trust Good Practice Guide 237 – Natural Ventilation in Non-Domestic Buildings
- W. UNEP
 - 1. The Montreal Protocol on Substances that Deplete the Ozone Layer

X. US Code of Federal Regulations

1. Definition of Farmland, Title 7, Volume 6, Parts 400-699, Section 657.5
2. Definition of Wetlands, 40 CFR, Parts 230-233, and Part 22

1.4 DEFINITIONS

- A. Point of Final Assembly: Location where individual components are assembled into the product that is furnished and installed by the tradesmen.
- B. Point of Harvest/Extraction/Recovery: Location where raw material is gathered for use in production.
- C. Solar Reflectance Index (SRI): A measure of a material's ability to reject solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.9) is equal to 0, and a standard white (reflectance 0.80, emittance 0.90) is equal to 100.
- D. Regional Material: Building materials or products that have been extracted, harvested or recovered, as well as manufactured, within 500 miles of the project site.
- E. Rapidly Renewable Material: Building materials and products made from plants that are typically harvested within a ten-year cycle or shorter.
- F. Chain of Custody: A document that tracks the movement of a wood product from the forest to a vendor and is used to verify compliance with FSC guidelines. A "vendor" is defined as the company that supplies wood products to project contractors or subcontractors for on-site installation.
- G. Volatile Organic Compounds (VOCs): Carbon compounds that participate in atmospheric photochemical reactions (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, and ammonium carbonate). The compounds vaporize (become a gas) at normal room temperatures.
- H. Chlorofluorocarbons (CFCs): Hydrocarbons that deplete the stratospheric ozone layer.
- I. Hydrochlorofluorocarbons (HCFCs): Refrigerants used in building that deplete the stratospheric ozone layer, but to a lesser extent than CFCs.
- J. Post-Consumer Waste: Waste material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of materials from the distribution chain. Examples of this category include construction and demolition debris, materials collected through curbside and drop-off recycling programs, broken pallets, discarded products (e.g., furniture, cabinetry and decking) and urban maintenance waste (e.g., leaves, grass clippings, tree trimmings, etc.).
- K. Pre-Consumer Content: Defined as material diverted from the waste stream during the manufacturing process. Examples in this category include planer shavings, sawdust, chips, , sunflower seed hulls, walnut shells, culls, trimmed materials, print overruns, over-issue publications, and obsolete inventories. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.

1.5 SUSTAINABLE DESIGN GOALS IMPLEMENTATION

- A. Contractor shall participate in promoting efforts of the Owner and Architect to insure the Sustainable Design Goals for the Project are met.
- B. Each subcontractor shares Contractor's and Owner's commitment to implement work practices consistent with requirements necessary to achieve a sustainable design.
 - 1. Each spec section will reference corresponding sustainability requirements as needed.
- C. Meetings: Sustainable Design Goals shall be discussed at the following meetings
 - 1. Pre-bid meeting
 - 2. Pre-construction meeting
 - 3. Regular Job Site meetings
- D. Building Commissioning: Commissioning seeks to improve the way buildings are designed, constructed and delivered to the Owner and the occupants. Commissioning is a quality process that requires the project team to integrate quality into the design and construction process. The commissioning specification for this project encompasses four elements
 - 1. Providing contractors with requirements to improve the way they do things, resulting in better installations
 - 2. Ensuring through documented observation and testing that systems actually are installed and perform correctly.
 - 3. Ensuring that excellent O&M documentation is left with the Owner and user.
 - 4. Ensuring that Owner staff is expertly trained in O&M procedures.

1.6 COMPLIANCE

- A. Contractor shall support this goal through their adherence to the sustainable building criteria referenced in the project manual.
- B. Sustainable Material Requirements:
 - 1. Construction Waste Management: See Section 017419
 - 2. Recycled-Content Materials: At a minimum, the following building components shall be provided containing post and/or pre consumer recycled materials:
 - Structural Steel (70% recycled content)
 - Gypsum Wall Board (90% recycled content)
 - Acoustical Ceiling Tiles
 - Resilient flooring
 - Toilet Compartments
 - 3. Local/regional Materials:
 - At a minimum, the following building components shall be extracted, processed and manufactured within 500 miles of the project:
 - Concrete
 - Concrete Wall Panels
 - Concrete Masonry Units

Gypsum Wall Board
Resilient Flooring

- C. Certified Wood Materials: See Sections 06100 and 056200

1.7 LOW EMITTING MATERIALS

- A. Adhesive and Sealant VOC Limits: Per South Coast Rule #1168 by the South Coast Air Quality Management District (<http://www.aqmd.gov/rules/reg/reg11/r1168.pdf>)

1. Architectural Applications

- a. Indoor Carpet Adhesives: 50 g/L
- b. Carpet Pad Adhesives: 50 g/L
- c. Sub floor Adhesives: 50 g/L
- d. Ceramic Tile Adhesives: 65 g/L
- e. VCT and Asphalt Tile Adhesives: 50 g/L
- f. Dry Wall and Panel Adhesives: 50 g/L
- g. Cove Base Adhesives: 50 g/L
- h. Multipurpose Construction Adhesives: 70 g/L
- i. Structural Glazing Adhesives: 100 g/L

2. Specialty Applications:

- a. PVC Welding: 510 g/L
- b. CPVC Welding: 490 g/L
- c. ABS Welding: 325 g/L
- d. Plastic Cement Welding: 250 g/L
- e. Adhesive Primer for Plastic: 550 g/L
- f. Contact Adhesive: 80 g/L
- g. Special Purpose Contact Adhesive: 250 g/L
- h. Top and Trim Adhesive: 250 g/L

3. For adhesives, adhesive bonding primers, or other primers not regulated by the above two tables and applied to the following substrates, the following limits shall apply

4. Substrate Specific Applications

- a. Metal to Metal: 30 g/L
- b. Plastic Foams: 50 g/L
- c. Porous Material (except wood): 50 g/L
- d. Wood: 30 g/L
- e. Fiberglass: 80 g/L

5. If an adhesive is used to bond dissimilar substrates together the adhesive with the highest VOC content shall be allowed.

6. Sealants

- a. Architectural: 250 g/L
- b. Non-membrane Roof: 300 g/L
- c. Single-Ply Roof Membrane: 450 g/L

- d. Other: 420 g/L
7. Sealant Primers
- a. Architectural Non Porous: 250 g/L
 - b. Architectural Porous: 775 g/L
 - c. Modified Bituminous: 500 g/L
 - d. Other: 750 g/L
- B. Paints & Coatings
- 1. Volatile organic compound (VOC) content of interior paints, interior primers, and anticorrosive paints used in interior applications shall not exceed the limits defined in the Green Seal Environmental Standards for Paints (GS-11, dated 5/20/93) and Anti-Corrosive Paints (GC-03, dated 1/7/97), of Green Seal, Washington, DC. The VOC limits defined in the referenced Green Seal standards are as follows. Each VOC limit is defined in grams per liter, and exclude water and tinting color added at the point of sale (as determined by U.S. EPA Reference Test Method 24).
 - 2. Interior Paints & Primers
 - a. Non-flat: 150 g/L
 - b. Flat: 50 g/L
 - 3. Anti-Corrosive Paints
 - a. Gloss: 250 g/L
 - b. Semi-gloss: 250 g/L
 - c. Flat: 250 g/L
 - 4. Clear Wood Finishes: 350 g/L
 - 5. Varnish: 350 g/L
 - 6. Lacquer: 550 g/L
 - 7. Floor Coatings: 100 g/L
 - 8. Sealers
 - a. Waterproofing sealers: 250 g/L
 - b. Sanding sealers: 275 g/L
 - c. All other sealers: 200 g/L
 - 9. Stains, Interior: 250 g/L

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 018115

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Owner Start Up Check Lists

1.2 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- B. Related Sections - Refer to all FIELD QUALITY CONTROL sections included in the individual specification sections that detail the required pre-start inspections, functional testing, and documentation to be completed, and reports required to be delivered to the owner. All the specified work and deliverables are required, and shall be completed accordingly by the Contractor.

1.3 DEFINITIONS

- A. Owner Start Up Checklists : Checklists applicable to the scope of the project shall be provided by the Design Engineer detailing pre-start inspections and functional verifications required to be completed by the Contractor. These checks are in addition to the FIELD QUALITY CONTROL sections included in the individual specification sections, and do not eliminate the need of the Contractor to meet the requirements in those sections.
- B. Commissioning : Execution of all required pre-start inspections, start-up activities, and functional verification and testing of systems, subsystems, equipment, and components, and completion and delivery of all related documentation, checklists, and reports specified in the contract documents.
- C. CxA: Commissioning Authority. The Commissioning Authority (CxA) shall be the Hannaford Brothers Company Construction Project Manager (CPM).
- D. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the Contractor or required by the Contract Documents..

B. Members Appointed by Owner:

1. The Commissioning Authority (CxA) shall be the Hannaford Brothers Company Construction Project Manager (CPM). .
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

- A. Document specific quality assurance and functional testing requirements in the FIELD QUALITY CONTROL sections of the individual specification sections included in the contract documents.
- B. Provide Start Up Checklists to the CxA and Contractor.
- C. Assign operation and maintenance personnel to participate in commissioning team activities and work with the Contractor to witness start up and functional performance testing activities in accordance with specification requirements.

1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Review each FIELD QUALITY CONTROL requirements of the individual specification sections included in the contract documents. Perform activities and deliver documentation and reports as required in the specifications to the CxA.
- B. Review Start Up Checklists, perform required activities and deliver completed checklists to CxA.
- C. Provide utility services required for the commissioning process.
- D. Identify and notify CxA of any off-season test(s) not performed and obtain approval for a schedule for their completion.
- E. The Contractor shall assign representatives or sub-contractors with expertise and authority to act on its behalf and shall schedule them to participate in and perform the commissioning process activities and deliver the required documentation and reports.
- F. Evaluate and document performance deficiencies identified in inspections and tests, include in report deficiency logs, collaborate with the parties responsible for system and equipment installation and operation, and take corrective action necessary to fix deficiency.
- G. Obtain and submit operation and maintenance data for systems, subsystems, and equipment to the CxA as specified in Section 017823 Operation Maintenance Data and the other individual systems, subsystems, equipment, and components specification sections.
- H. Provide a schedule for operation and maintenance data submittals, equipment startup, and testing to CxA. Update schedule on a weekly basis throughout the construction period.
- I. Provide training sessions for Owner's operation and maintenance personnel as specified in the contract documents.

1.7 CxA's RESPONSIBILITIES

- A. Review the Commissioning activities, documentation, checklists, and reporting requirements contained in the Contract Documents with the Contractor to ensure that all requirements are understood and acknowledged and shall be delivered.
- B. Conduct construction-phase coordination meetings as necessary for the purpose of reviewing the commissioning activities and establishing tentative schedules for functional testing, operation and maintenance training sessions, TAB work and Project completion
- C. Observe and inspect construction and report progress and deficiencies. Observe systems and equipment installation for adequate accessibility for maintenance and component replacement or repair.
- D. Witness and document tests and observations.
- E. Compile inspection reports, start-up checklists, functional test data, O&M documentation, warranties, and all other documentation and commissioning reports specified in the Contract Documents. Deliver all documentation to Facilities and Maintenance Team at project turnover.
- F. Verify that the Contractor logs all deficiencies discovered during commissioning and corrects all deficiencies.

1.8 COMMISSIONING DOCUMENTATION

- A. Contractor shall deliver all required documentation, checklists, and reports to the CxA.
- B. CxA shall compile inspection reports, start-up checklists, functional test data, O&M documentation, warranties, and all other documentation and commissioning reports specified in the Contract Documents. Deliver all documentation to Facilities and Maintenance Team at project turnover.
- C. Start-Up Checklists: Owner will develop and provide checklists for the following systems :
 - 1. Outside Air Unit
 - 2. Rooftop Air Handlers
 - 3. Condensing Units
- D. Field Quality Control Specifications : Field Quality Control requirements for specific systems, subsystems, equipment, and components are documented in the individual specification sections included in the contract documents. Contractor shall complete the required activities and deliver documentation and reports to the Owner accordingly.
- E. Contractor shall document any off-season test(s) not performed including a schedule and plan for their completion.
- F. Corrective Action Documents: Contractor shall document corrective action taken for systems and equipment that fail tests. Include required modifications to systems and equipment and revisions to test procedures, if any. Retest systems and equipment requiring corrective action and document retest results.

- G. Issues Log: Contractor shall prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the Contract Documents. Identify and track issues as they are encountered, documenting the status of unresolved and resolved issues.

1. Creating an Issues Log Entry

- a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
- b. Assign a descriptive title of the issue
- c. Identify date and time of the issue
- d. Identify test number of test being performed at the time of the observation, if applicable, for cross-reference
- e. Identify system, subsystem, and equipment to which the issue applies
- f. Identify location of system, subsystem and equipment
- g. Include information that may be helpful in diagnosing or evaluating the issue
- h. Note recommended corrective action
- i. Identify construction team member responsible for corrective action
- j. Identify person documenting the issue

2. Documenting Issue Resolution

- a. Log date correction is completed or the issue is resolved
- b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any
- c. Identify changes to the Contract Documents that may require action.
- d. Contractor shall state that correction was completed and system, subsystem and equipment, and retest.
- e. Identify person(s) who corrected or resolved the issue
- f. Identify person(s) documenting the issue resolution

1.9 SUBMITTALS

- A. Contractor shall submit commissioning schedule to CxA and provide updates of any schedule changes.
- B. Test Checklists, Documentation, and Reports: Contractor shall deliver all required checklists, documentation, and reports to the CxA.
- C. Systems Manual: Contractor shall submit the systems manual per Section 017823 Operations Maintenance Data

1.10 QUALITY ASSURANCE

- A. Test Equipment Calibration: Contractor shall provide all required test equipment. Test Equipment calibration shall comply with the test equipment manufacturer's calibration procedures and intervals. Contractor shall recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Calibration tags shall be affixed to test instruments. Instruments shall have been calibrated within six months prior to use.

1.11 COORDINATION

- A. Coordinating Meetings: Contractor shall conduct coordination meetings with the commissioning team to review construction, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities..
- B. Pretesting Meetings: Contractor shall conduct pretest meetings of the commissioning team to review startup reports, pretest inspection results, testing procedures, testing personnel and instrumentation requirements and manufacturer's authorized service representative services for each system, subsystem, equipment, and component to be tested.
- C. Testing Coordination: Contractor shall coordinate sequence of testing activities with CPM and subcontractors as required to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples and similar activities
- D. Manufacturer's Field Services: Contractor shall coordinate services of manufacturer's field services.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

- A. Contractor shall coordinate, schedule, and facilitate all training as required by the contract documents.

END OF SECTION 019113

SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION
PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Demolition and removal of selected mechanical/electrical equipment
 - 4. Salvage of existing items to be reused or recycled.
 - 5. Coordination with Owner for renovations adjacent to existing occupied spaces.
 - 6. Temporary dust partitions.
 - 7. Temporary ventilation.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Pre-demolition Conference: Conduct conference at Project site

1.4 PROJECT 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. Maintain access to existing walkways, and other adjacent occupied or used facilities. Do not close or obstruct

walkways, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.

- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Coordinate with owner any items to be removed before selective demolition
- 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 have been removed by Owner under a separate contract.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- E. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- F. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- G. Storage or sale of removed items or materials on-site is not permitted.
- H. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.5 WARRANTY

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

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Engage a professional engineer to survey 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 demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or preconstruction videotapes.
- G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. See Divisions 21, 22, 23 and 26 for demolition information for these disciplines.

3.3 PREPARATION

- A. 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.

1. Comply with requirements for access and protection specified in Division 01 Section "Construction Facilities and Temporary Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain
- C. Temporary Enclosures: Provide temporary enclosures for protection of existing building and 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 not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
- D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
 1. All temporary construction partitions shall be extended from the floor through the suspended ceiling, to the underside of the floor deck above.
 2. Construct temporary dust partitions out of metal studs and 8 foot high 1/2" fire-retardant plywood on one side. Provide fire-retardant vinyl, adequately supported from top fo plywood to underside of structure. Seal all gaps and around perimeter with duct tape. Temporary doors for partitions shall be 3'-0" x 7'-0" doors with standard lockset hardware, closers, weatherstripping and keyed locksets to match Owner's.
 3. All temporary dust partitions in place less for short time duration approved by the Owner may be fire-retardant vinyl and adequately supported sealed with duct tape.
 4. Provide walk-off mats both inside and outside the construction area at doors entering Owner occupied areas.
 5. Temporary partitions shall remain in place until all cleaning within the work areas has been completed.
- E. Duct Work Protection: Air-handling ducts shall be shut down or covered with protective filtering material whenever possible during demolition activities. Protective filtering material covering or shut-down of air-handling ducts shall be approved by the Owner before starting demolition and alteration operations.
- F. Temporary Shoring: 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.

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, to minimize disturbance of adjacent surfaces. 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 fire watch and 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. Remove and replace or reinstall existing construction as necessary to permit installation and alteration of mechanical and electrical work. Coordinate all removals with appropriate trades.
6. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts. Collect water used for cutting operations to prevent damage to existing construction to remain. Coordinate time and use of pneumatic impact tools with the Owner. Pneumatic impact tools shall not be used only when the building and adjacent tenants spaces are occupied.
7. Dispose of demolished items and materials promptly.
8. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner indicated on Drawings.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
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.

D. 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.

E. Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

3.5 PATCHING AND REPAIRS

- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Work Exposed to View: Do not cut or patch in a manner that would, in the Architect's opinion, result in a lessening of the building's aesthetic qualities. Generally, cut from exposed side into concealed spaces to avoid unnecessary damage to finish. Do not cut and patch in a manner that would result in substantial visual evidence of cut and patch work. Restore exposed finishes of patched areas in a manner, which eliminates evidence of patching and refinishing. For continuous surfaces, extend refinish to nearest intersection, with a neat transition to adjacent surfaces.
- C. Floors and Walls: Where walls or partitions that are demolished 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 existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 - 3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- D. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 032000 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies steel reinforcement for cast-in place concrete foundations and slabs.
- B. Reinforcing bar dowels in concrete foundations for attachment of masonry vertical reinforcing.

1.2 QUALITY ASSURANCE

- A. ACI and CRSI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 315, "Manual of Standard Practice for Detailing Reinforced Concrete."
 - 2. ACI 318/318R, "Building Code Requirements for Structural Concrete and Commentary."
 - 3. CRSI "Manual of Standard Practice."

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Bar and Wire Fabric Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or pre-cast concrete according to CRSI's "Manual of Standard Practice."
 - 1. Where accessory legs will be exposed in finished concrete surfaces, provide plastic tipped legs in a color to match concrete color when cured.
- D. Slab Construction Joint Dowels: PNA Diamond Dowel System, PNA Construction Technologies; pna-inc.com.
 - 1. Load Plates: Saw cut from hot rolled plate per ASTM A36, 1/4-inch thick by 4-1/2-inch square.
 - 2. Pocket Former: High-density plastic pocket former with nailing fins for attachment to edge forms.
- E. Tie Wire: Plain-steel wire, ASTM A 82, as drawn, 16 gage minimum.

2.2 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to ACI 315 and CRSI's "Manual of Standard Practice."

- B. Fabricate bars according to shop drawings to required lengths, shapes, and bends. Do not re-bend or straighten reinforcement in a manner that weakens the material.

PART 3 - EXECUTION

3.1 PLACING STEEL REINFORCEMENT

- A. General: Comply with ACI 315 and CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Reinforcement shall be free from flaky rust, grease, mud, oil, dirt, scale, paint, and other deleterious materials that could affect bonding to concrete at the time reinforcement is put in place, and at the time the concrete is poured.
- C. Reinforcement shall be held firmly in position by suitable metal devices that insure accurate spacing in all directions, preventing displacement during concrete pour and maintaining proper concrete cover. Tie wires shall be cut off close to the bars or bent into contact with the bars so as to provide minimum concrete cover indicated.
- D. Concrete coverage shall be as indicated, or if not indicated, as required by ACI 318.
- E. Install reinforcement to accommodate placement of formed opening bond outs.
- F. Do not place reinforcing bars more than 6 inches beyond the last leg of continuous bar support. Do not use reinforcing setting on supports as bases for runways for concrete conveying equipment and similar construction loads.
- G. Lap splices shall be used instead of mechanical splices to the maximum extent possible. Mechanical splices may be used where constructability, economy, or other pertinent issues dictate their use. Welding of ASTM A 615, Grade 60 reinforcing bars not permitted.
- H. Install welded wire fabric in longest practical lengths. Lap adjoining pieces at least one full mesh plus 2 inches at sides and ends and tie wire together. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- I. Place flat sheet welded wire reinforcement one-third of slab thickness below top surface of slab unless indicated otherwise. Provide adequate support of welded wire reinforcement in slabs to maintain mesh at proper elevation within slab. Pulling of mesh as the means to place in proper position is not acceptable.
- J. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.2 FIELD QUALITY CONTROL

- A. Field inspection will be performed under provisions of Section 01400 "Quality Control."

END OF SECTION 032000

SECTION 033200 - CONCRETE SLABS ON GRADE & STRUCT. CONCRETE SLABS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in place concrete slabs on grade, and sidewalks.
2. Concrete floor sealer.
3. Concrete rapid set admixture
4. Joint sealant.
5. Underslab insulation.
6. Edge Insulation

B. See Division 01 Section 018115 Sustainable Design Requirements.

C. See Division 3 Section "Concrete Reinforcement" for steel reinforcement in slabs.

D. See Division 3 Section "Cast-In-Place Concrete for Foundations" for concrete foundations and exterior stairs.

E. See Division 31 Section "Earth Moving" for fill under slabs-on-grade.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Mix Designs: For each concrete mixture. Submit proposed mix designs and documentation, including laboratory test results for concrete materials and mix design tests if trial batched, or field test data if field experience methods are utilized to establish the mix design. Proposed mix designs shall include strength of concrete, brand and type of cement, aggregate source, admixtures, percent of entrained air and water-cement ratio.

1. Submit proposed mix designs for concrete at least 15 days before start of concreting. No concrete shall be placed without an approved mix design. All concrete placed without an approved mix design shall be subject to in-place testing (cores or non-destructive testing as required by the Engineer). All such testing shall be at the Contractor's expense.

C. Record Documentation: Accurately record actual locations of embedded utilities and components that are concealed from view. Submit as part of the project record documents specified in Section 01700 "Contract Closeout"

1.3 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.
- B. **Testing Agency Qualifications:** An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1.
- C. **Tolerance Testing of Slabs:** Owner will employ an independent testing laboratory to perform an instrument check of the slab surface for flatness and levelness.
- D. **Applicator's Qualifications - Interior Curing and Sealing Compound:** Shall be approved, authorized, factory trained, and licensed by coating system manufacturer. Applicator shall have a minimum of 5 years experience in application of coating system on commercial projects similar scope and size to those for this project with a record of successful in-service performance.
- E. **Source Limitations:** Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer
- F. **ACI Publications:** Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 302, "Guide for Concrete Floor and Slab Construction."
 - 3. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. **Preinstallation Conference:** Conduct conference at Project site.

1.4 PROJECT CONDITIONS

- A. Install slabs after the roof membrane has been installed and roof is watertight, unless otherwise acceptable to Owner.
- B. Before pouring slab on grade, verify plumbing, electrical stub-ups, and pit locations with refrigeration designer, mechanical contractor, and Owner. All electrical conduit and horizontal plumbing lines shall be buried in the sub-grade.
- C. Concrete placement operations shall not damage underground plumbing, electrical or refrigeration lines nor damage any embedded items. Wheelbarrows, buggies or pumps shall be used if access to the placement area by truck is restricted or may result in damage to underground items. Any underground lines damaged by concrete placement operations shall be repaired at the Contractor's expense.

- D. Sub-grade shall be frost-free.
- E. To the maximum extent possible schedule slab placements with air temperatures rising after concrete placement. Attempt to schedule slab placements according to favorable weather reports.
- F. Coordinate temporary heating, if required, to prevent localized premature drying. Coordinate type of heating system to prevent carbonation of the concrete surface, providing proper ventilation of fumes.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Provide product manufactured and extracted within 500 miles of the project site.
- B. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland cement: ASTM C 150, Type I Normal-Weight Aggregates: ASTM C 33, #57 gradation (nominal size 1-inch to No. 4).
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 3. Slag: 25% of total materials
- C. Lightweight Aggregate: ASTM C 330, 3/4-inch nominal maximum aggregate size.
- D. Water: ASTM C 94 and potable.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Rapid Hardening Concrete Mix – used when filling trench drains
 - 1. Products ASTM C109 compressive strength, ASTM C78 Flexural strength. Follow manufacturers' instructions for use.
 - a. RapidSet Concrete Mix by CTS Cement Manf. Corp., 11065 Knott Ave., Suite A, Cypress, CA 90630 800-929-3030 www.rapidset.com
 - b. Quikrete Commercial Grade FastSet by The Quikrete Companies, One Securities Centre, 3490 Piedmont Rd., NE, Suite 1300, Atlanta, GA 30305 404-634-9100 www.quikrete.com
- G. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494, Type A or Type F.
 - 2. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
 - 3. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

- H. Reinforcement: ASTM 615, Grade 60
- I. Welded Wire Fabric: ASTM A 185 , Flat sheets

2.2 UNDERSLAB INSULATION

- A. Underslab Board Insulation: Extruded polystyrene foam board insulation; closed cell, complying with ASTM C578, Type IV; 25 PSI minimum compressive strength; 2.5% maximum water absorption; k value of 0.27; manufacturer's standard lengths and widths.
- B. Edge Insulation: Provide ½” polystyrene foam board insulation

2.3 CURING AND SEALING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Moisture-Retaining Cover: ASTM C 171, white polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Interior Curing and Sealing Compound (Exposed Back of House Slabs): Waterbased, inorganic silicate compound, Ashford Formula manufactured by Curecrete Chemical Company.
- E. Clear, Waterborne, Membrane-Forming Curing Compound (Interior Slabs Receiving resilient Flooring): ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering. Verify curing systems and flooring adhesives.
- F. Anti-Spalling Compound: Solvent-free silane modified siloxane emulsion, Sika Sikagard 701W.
 - 1. Application: For all exterior slabs and sidewalks.

2.4 JOINT SEALANT

- A. Single-Component Pourable Urethane Sealant:
 - 1. Products:
 - a. Sika Corporation, Inc.; Sikaflex - 1CSL.
 - b. Sonneborn, Division of ChemRex Inc.; SL 1.
 - 2. Type and Grade: S (single component) and P (pourable).
 - 3. Class: 25.
 - 4. Uses Related to Exposure: T (traffic) and NT (nontraffic).
 - 5. Uses Related to Joint Substrates: M, A, and, as applicable to joint substrates indicated, O.

2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips:
 - 1. Joints to Receive Sealant: ASTM D4819, Type II, two pound minimum density closed cell polyethylene with 1/2-inch deep top strip-off edge to allow installation of joint sealant; 1/2-inch thickness by full depth of slab.
 - a. Foam Peel HT; Foamtastic, division of Hohmann & Barnard or accepted equivalent.
 - 2. Joint-Filler Strips Left Exposed: ASTM D 1751, asphalt-saturated cellulosic fiber .
- B. Construction Joint Form: Keyed joint, 24-gauge galvanized, Dayton Superior G-33 Screed Keyed Joint or accepted equivalent.

2.6 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Proportion normal-weight concrete mixture for interior slabs as follows:
 - 1. Minimum Compressive Strength: 1800 psi at 3 days
 - 2. Minimum Compressive Strength: 3000 psi at 28 days.
 - 3. Maximum Water-Cementitious Materials Ratio: 0.54
 - 4. Slump Limit: 4 inches, plus or minus 1-1/2 inch.
 - a. 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture.
 - 5. Air Content: Do not allow air content of troweled finished floor to exceed 3 percent. Entrapped air only, do not add air entraining admixture.
- C. Proportion normal-weight concrete mixture for exterior slabs and sidewalks as follows:
 - 1. Minimum Compressive Strength: 4000 psi at 28 days.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.44.
 - 3. Slump Limit: 4 inches, plus or minus 1-1/2 inch.
 - 4. Air Content: 6.5 percent, plus or minus 1 percent at point of delivery.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information. Include on batch ticket the amount of water introduced into the mix at the plant, and amount of water that can be added to stay within the specified water-cementitious materials ratio.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EDGE FORMS AND SCREED STRIPS FOR SLABS

- A. Set edge forms or bulkheads and intermediate screed for slabs to obtain required elevations and contours in finished slab surface. Secure to resist movement by plastic concrete. Provide secure edge forms or screed strips to support strike-off templates or accepted compacting vibrating-type screeds. Wet screeding will not be permitted.

3.2 EMBEDDED ITEMS, INSERTS AND OPENINGS

- A. Provide formed openings where required for items to be embedded in or passing through concrete work.
- B. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- C. Coordinate work of other Sections in forming and placing openings, recesses, drains, sleeves, bolts, anchors and inserts.

3.3 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect. Joints are not permitted in slabs of coolers and freezers.
- C. Contraction (Control) Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, with a one inch minimum, as follows:
 - 1. Sawed Joints: Form contraction joints with Soff-Cut early-entry dry-cut control joint saw cutting. Install cuts at each control joint location as soon as concrete will support weight of saw and operator without disturbing final finish. Complete cutting operations within 2 hours after final pass of trowel. Use Soff-Cut blades and skid plates, using a new skid plate with each new blade. Remove debris in path of cut and under skid plate before cutting. Install Soff-Cut joint protector at saw-cut intersection prior to cross-cut. Remove dry powder saw cut concrete spoils immediately without disturbing finish.
 - 2. Joint Width: 1/8-inch for slabs to receive floor coverings. 1/4-inch for joints to be left exposed and filled with joint sealant.
 - 3. Make initial saw cut at mid-length of slab and proceed by saw-cutting at mid-length of each subsequent panel until all joints have been cut.
 - 4. Joints are not permitted in slabs of coolers or freezers.
 - 5. Avoid traffic across saw cut until sufficient strength is gained to protect joint edges.

- D. Isolation Joints in Slabs-on-Grade: Install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, and other locations, as indicated. Place at proper elevations and secure to prevent displacement.

3.4 UNDERSLAB INSULATION

- A. Place underslab insulation, thickness as noted on the drawings, on graded, smooth, dry compacted fill. Stagger all joints when insulation is stacked to achieve design thickness. Pour concrete slab directly over underslab insulation.

3.5 CONCRETE SLAB PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Just before concrete slab on exposed grade placement, wet sub-grade but do not saturate.
- C. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete. Do not permit cold joints to occur.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners. Maintain reinforcement in proper position during concrete placement operations. See requirements in Division 3 Section "Concrete Reinforcing" for reinforcement placement.
 - 2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats and highway straightedge to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on plastic surface.
 - 3. Slope surfaces uniformly to drains where required. Maintain floor elevation at walls; pitch uniformly to drains at 1/8 inch per foot or as indicated on Drawings.
 - 4. Maintain reinforcing in proper position on chairs during concrete placement.
- D. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents. Do not use chemical accelerators, unless otherwise specified and approved in mix designs.
 - 4. All temporary heat, insulated blankets, coverings, hay, or other equipment and materials necessary to protect the concrete work from physical damage caused by frost, freezing action, or low temperature shall be supplied under this section.
- E. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas
- F. Use of accelerating and retarding admixtures, if approved for use, does not relax the cold weather and hot weather placement requirements.
- G. Retain paragraph below if exterior cast-in-place concrete stairs and landing are in project.
- H. Provide uniform wood float finish for exterior platforms.

3.6 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven float blades or float shoes only, or by hand floating if area is small or inaccessible to power driven floats. If pan floats are used, the first floating shall be done by power trowel with conventional float blades to open surface to allow release of bleed water and prevent blistering. Re-straighten, cut down high spots, and fill low spots using a highway straightedge as required to meet the floor flatness and levelness tolerances. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish. .Trowel Finish: Comply with ACI class 4 finish and the following requirements. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 2. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, , paint, or another thin-film-finish coating system.
 3. Apply a trowel finish to surfaces to be covered with ceramic or quarry tile, slight trowel marks and variation in texture is acceptable.
 4. Exposed Slabs: Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot-long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 3/16 inch.
 - a. Slabs Receiving Floor Finishes: Finish surfaces to the following tolerances, according to ASTM E 1155:
 - b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

- c. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15; for suspended slabs.
- C. Placing Exterior Concrete Walks and Flatwork: Place concrete, screed and wood float surfaces to a smooth and uniform finish, free of open texturing and exposed aggregate. Avoid working bleed water into surface mortar.
 - 1. Bull float directly behind screed before bleedwater appears.
 - 2. Immediately behind bullfloat, drag broom across surface for a light broom finish if surface paste provides adequate stiffness to maintain acceptable surface texture. If bleedwater appears before application of broom finish, allow surface water to evaporate before brooming.
 - 3. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.7 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture-Retaining-Cover Curing (Slabs receiving ceramic tile, quarry tile, epoxy coatings, exterior walks and slabs): Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. As an alternative to moisture-retaining-cover curing, Contractor may submit a proposed plan for moist curing by use soaker hoses and ponding to Architect for review. If Contractor can demonstrate effectiveness in achieving desired final product, then proposed moist curing method will be accepted.
 - b. Do not allow foot or other traffic over slabs during seven-day curing period. Do not use slabs to store construction materials during seven day curing period.
 - c. Cure slabs or pads a minimum of 14 days before placing equipment.

2. Curing Compound (Slabs to receive resilient flooring and carpet) : Apply uniformly in continuous operation by power spray or roller, in two coats applied perpendicular to previous coat according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Do not allow foot or other traffic over slabs during seven-day curing period. Do not use slabs to store construction materials during seven day curing period.
 - b. Slabs shall cure a minimum of 28 days before placement of floor coverings.
 - c. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

 - E. Interior Curing and Sealing Compound (Exposed slabs at receiving areas, grocery storage, prep areas, freezers and coolers): Apply interior curing and sealing compound after final troweling.
 1. Spray apply wet coat of compound with a low pressure high volume sprayer to saturate the entire surface.
 2. Keep the entire surface wet with compound for 30 minutes, brooming excess product onto the dry spots or re-spraying the dry spots immediately.
 3. After 30 minute surface wetting period and compound begins to dry into the surface and becomes slippery underfoot, lightly mist the surface with water to aid penetration and to bring alkali to the surface. Agitate the surface with broom to aid in penetration of sealer into the concrete surface.
 4. As the compound again begins to dry into the surface again and becomes slippery underfoot, flush the surface with water and squeegee the surface totally dry, removing all excess product, alkali and other impurities brought to the surface.
 5. Concrete shall remain above 40°F for a minimum of 7 days to permit proper curing and sealing.

 - F. Anti-Spalling Compound: Exterior concrete walks and flatwork shall receive two coats of anti-spalling compound, applied in wet on wet fashion to completely saturate the surface.
 1. Allow slab to cure for a minimum of 28 days. Concrete shall be thoroughly dry and absorbent for application of compound. Surface temperature shall be 45 degrees F and rising.
- 3.8 JOINT SEALANT
- A. Install sealant in all construction, isolation and control joints in exposed slabs receiving interior curing and sealing compound at back of house areas including receiving and storage areas, prep areas, freezers and coolers, in accordance with manufacturer's recommendations.
 - B. Allow slab to cure to the maximum extent possible before installing joint sealant.
 - C. Remove all loose material joints from joints by wire brushing.
 - D. Provide backer material to provide joint depth to width ratio required by sealant manufacturer.

- E. Concrete slabs shall be dry. Slab temperature shall be 40°F minimum and rising.
- F. Install sealant in all construction, isolation, and control joints in all concrete floors not receiving flooring (i.e., back room storage areas, coolers, freezers, walks) in accordance with manufacturer's recommendations.
- G. Allow 3 days cure time before foot traffic and one week before full service use.

3.9 CONCRETE REPAIRS

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon written direction of Architect for each individual area. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- C. Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inchwide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Engineer.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 6. Repair random cracks and single holes 1 inch or less in diameter with non-shrink patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
 - 7. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.10 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Contractor shall engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports during concrete placement according to requirements specified in this Article.
1. Submit proposed mix design to inspection and testing firm for review before commencement of the Work.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - b. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive strength testing if adequate evidence of satisfactory strength is provided.
 2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
 - a. Properly store cylinders while awaiting transport to laboratory, maintaining temperature between 60°F and 80°F. Deliver to laboratory for curing within 24 hours of casting test specimen.
 - b. Field-Cured Cylinders: For cold weather concrete operations, prepare an additional set of four standard cylinders to be cured at the site, maintaining cylinders in the conditions and at the temperature of the in-place concrete. Protect field cylinders from being hit, damaged, and from vibration during initial set.
 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
 7. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
 8. Field Reports: In addition to test results, include weather, ambient temperature, and length of time concrete was in truck.

- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- E. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.
- F. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- G. Where floor drains occur, water test the slab in the presence of the Architect to confirm proper slope to drains without high and low areas that cause ponding and bird baths. Grind high spots to permit drainage.
- H. The Owner may employ a separate testing laboratory to perform all other concrete tests. Allow free access to material stockpiles and facilities at all times.
- I. Tolerance Testing of Slabs: Owner will employ an independent testing laboratory to perform an instrument check of the slab surface for flatness and levelness, as follows:
 - 1. Slabs on grade that receive architectural floor finishes: ASTM E1155.
 - 2. Remaining slabs on grade and mezzanine slabs: ACI 301.
 - 3. Written reports will be submitted to the Architect, Owner and Contractor showing a small scale floor plan of the slab surfaces and the results of the tolerance testing. Reports shall indicate if the slabs are acceptable and identify any areas that are non-compliant.

END OF SECTION 033200

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel trim.
2. Aircraft Cable
3. Steel framing and supports for the following:
 - a. Roof openings
 - b. Threaded rods and miscellaneous unistrut supports
 - c. Steel framing and supports for mechanical and electrical equipment
 - d. Steel framing and supports for applications where framing and supports are not specified in other Sections
4. Miscellaneous fabrications
 - a. Trench drain covers and supports
 - b. Pallet bumpers
5. Rough hardware

B. Related Sections including the following:

1. Division 01 Section 018115 Sustainable Design Requirements Summary
2. Division 03 Section "Cast-in Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge type inserts and other items indicated to be cast into concrete.
3. Division 04 Section "Unit Masonry for installing loose lintels and other items indicated to be built into unit masonry
4. Division 05 Section "Cold Form Metal Framing" for roof hatch platform joists.

1.2 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a minimum of eight years of experience.
- B. Erector Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a minimum of eight years of experience
- C. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1 "Structural Welding Code - Steel"
 2. AWS D1.2 "Structural Welding Code - Aluminum"
 3. AWS D1.3 "Structural Welding Code - Sheet Steel"

4. AWS D1.6 "Structural Welding Code - Stainless Steel"
5. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
6. If recertification of welders is required, retesting shall be the Contractor's responsibility.

1.3 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications, metal stairs, and gratings. 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.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.
- C. Store steel members off the ground, protected with a waterproof covering, and ventilated to avoid condensation, to protect against corrosion, deformation and other damage during storage and handling.
- D. Apply bituminous paint to concealed bottoms, sides and edges of cast-metal units set into concrete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 1. Products: Subject to compliance with requirements, provide one of the products specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

2.3 FERROUS METALS

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than **25** percent.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

- D. Rolled-Steel Floor Plate: Raised Pattern: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Rolled-Stainless-Steel Floor Plate: Raised Pattern, ASTM A 793.
- F. Steel Tubing: ASTM A 500, cold formed steel tubing
- G. Steel Pipe: ASTM A53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads
- H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-3, 1 5/8 x 1 5/8 inches. Channels made from galvanized steel complying with ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating, 0.079 inch nominal thickness.
 - 1. Product: Item No. BARCD009960 McNichols Company
 - 2. Woven Wire Infill Panels: .285 plain steel gage, 2 by 2 inch mesh crimped into 1 by 1/2 x 1/8 inch steel channel frames; orient wire mesh with wires horizontal and vertical; field finish.
 - a. Product: Weldmesh - McNichols Company

2.4 FASTENERS

- A. General: Type 304 stainless steel fasteners for exterior use and zinc plated fasteners with coating complying with ASTM B-633, Class Fe/Zn 5, at exterior walls. Provide stainless steel fasteners for fastening aluminum. Select fasteners for type, grade and class required.
- B. Cast-in-Place Anchors in Concrete: Threaded type or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASMT A-307, Grade A; with hex nuts, ASTM A 563, and, where indicated, flat washers
- D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, nuts, and where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.
- E. Eyebolts: ASTM A 489
- F. Machine Screws: ASME B28.6.3
- G. Lag Bolts: ASME B18.2.1
- H. Wood Screws: Flat head, ASME B18.6.1
- I. Plain Washers: Round ASME B18.22.1
- J. Lock Washers: Helical, spring type, ASME B18.21.1
- K. Threaded Bolts: FS FF-B0588, tumble wing type, class and style as required

- L. Chemical Anchors: Two-part epoxy systems with impacted bolt, rod or anchor as follows:
 - 1. Concrete Anchor: Epoxy capsule system similar to Hilti HVA Adhesive Anchor System, Ramset Chemset anchor system or approved equal.
 - 2. Masonry Anchor: Epoxy injection system similar to Hilti HIT-C-100 System.

2.5 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 .
- B. Galvanizing Repair Paint: SSPC-Paint 20, high zinc dust content paint for regalvanizing welds in steel.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 with a minimum compressive strength of 6500 psi at 28 days.
- E. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi. unless otherwise indicated.

2.6 FABRICATION

- A. General: Preassemble items in the shop to greatest extent possible. Use connection that maintain structural value of jointed pieces
 - 1. Cut, drill, and punch metals cleanly and accurately. Burned holes are not acceptable. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
 - 2. Weld corners and seams continuously . Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended
 - 3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous. Ease exposed edges to small uniform radius.
 - 4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
 - 5. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 24 inches o.c.
 - 6. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- B. Metal Deck Reinforcement: Provide reinforcement for deck openings not supported by structural members as follows, unless indicated otherwise:
 - 1. Openings 6 inches to 24 inches wide: Fabricate frame all four sides from 2 by 2 by 1/4 inch steel angle, angles perpendicular to ribs shall extend three ribs beyond each side of

- opening. Place frame on bottom surface of floor deck and on top surface of roof deck. Weld to bottom surface of each rib and 12 inches o.c. along edges parallel with deck.
 - 2. Openings greater than 24 inches wide: Provide structural steel around entire opening as indicated.
 - 3. Openings less than 6 inches square do not require reinforcing.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated of operable partition Shop Drawings.

2.7 MISCELLANEOUS STEEL TRIM

- A. Fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Exterior miscellaneous steel trim: Galvanize

2.8 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Size: Provide 4 inch diameter bollards at interior locations unless otherwise indicated.
 - a. Bollards shall extend 49 inches above grade or floor and 48 inches below surface, unless otherwise indicated.

2.9 MISCELLANEOUS FABRICATIONS

- A. Trench Drain Covers:
 - 1. Fabricate from rolled stainless steel floor plate, Type 304, of thickness indicated.
 - 2. Provide stainless steel angle supports as indicated.
 - 3. Provide flush stainless steel bar drop handles for lifting removable sections, one at each end of section
- B. Pallet Bumpers: Galvanize steel angle, 8 by 6 by 7/16 inch, unless otherwise indicated.
- C. Aircraft Cable: ½” diameter, galvanizaed aircraft cable. Provide accessories – eye bolts and hoist rings

2.10 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.
- B. Steel and Iron Finishes:
 - 1. Hot-dip galvanize items as indicated to comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.
 - 2. Preparation for Shop priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed metal fabrications.
 - a. Exteriors (SSPC Zone 1B): SSPC-SP-6/NACE No. 3, "Commercial Blast Cleaning."
 - b. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."
 - 3. Shop prime: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting: for shop painting."
- C. Stainless Steel Finishes:
 - 1. Remove tool and die marks and stretch lines or blend into finish.
 - 2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
 - a. Dull Satin Finish: No. 6, unless otherwise indicated.
 - 3. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, true.
 - 1. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication .
 - 2. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
- B. Bollards:

1. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
 2. Fill bollards solidly with concrete, mounding top surface to shed water.
- C. Touch up surfaces and finishes after erection
1. Painted Surfaces: Clean field welds, bolted connections, and abraded areas and touch up paint with the same materials as used for shop painting
 2. Galvanized Surfaces: Clean field welds, bolted connections and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055800 - FORMED METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following sheet metal fabrications:
 - 1. Interior stainless steel column covers.
 - 2. False column enclosures.
 - 3. Galvanized steel corner guards.
 - 4. Stainless steel shelves.
 - 5. Galvanized steel shelves.
 - 6. Steel shelf supports

- B. Related Sections:
 - 1. Division 01 Section 018115 Sustainable Design Requirements Summary
 - 2. Division 06 Section "Rough Carpentry" for concealed wood blocking required for installation.

PART 2 - PRODUCTS

2.1 SHEET METAL

- A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.
- B. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 coating.
- C. Steel Sheet: Uncoated, cold-rolled, ASTM A 1008/A 1008M.
- D. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.2 MISCELLANEOUS MATERIALS

- A. Fasteners: Use fasteners fabricated from same basic metal and alloy as fastened metal, unless otherwise indicated. Provide Phillips flat-head machine screws for exposed fasteners.

2.3 PAINTS AND COATINGS

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

2.4 FABRICATION

- A. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- wide hem on the concealed side, or ease edges and support them with concealed stiffeners.

- B. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness and sufficient strength for indicated use.
 - 1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- C. Where welding is indicated, weld joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.
- D. Column Wraps: Form column wrap to fit snugly to column from indicated metal of minimum thickness indicated below. Round edges and ends to remove sharp edges.
 - 1. Stainless Steel Sheet: 0.019 inch thick (26 gage).
 - 2. Size: Tight to column by indicated height.
 - 3. Joint: Hook and drive cleat.
 - 4. Finish: No. 4.
- E. False Column Enclosures: Form false column enclosures with removable side to detail indicated from metal of type and minimum thickness indicated below.
 - 1. Steel Sheet: 0.030 inch thick (22 gage).
 - 2. Finish: Primed for field finish.
- F. Corner Guards: Fabricate from minimum 0.058 inch thick (16 gage) galvanized steel sheet. Round edges and ends to remove sharp edges.
 - 1. Size: 4- by 4-inches by 4 feet high, unless indicated otherwise.
 - 2. Attachment: Countersunk flathead galvanized or stainless steel screws for attachment to concealed wood blocking.
- G. Stainless Steel Storage and Cooler Shelves: Form shelves to details indicated from 0.058 inch thick (16 gage) stainless steel sheet. Round edges and ends to remove sharp edges. Provide with indicated fasteners.
 - 1. Size: As indicated.
 - 2. Hanger Rods: 1/4-inch diameter galvanized steel rods.
 - 3. Channels: Stainless steel channels, size and configuration as indicated.
 - 4. Finish: No. 4.
 - 5. Cooler Panel Reinforcing: 0.058 inch thick (16 gage) galvanized steel sheet.
- H. Galvanized Steel Storage Shelf Supports: 2x2x1/4" angle with 6" gusset plate

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for steel sheet finishes.

C. Steel Sheet Finishes:

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1. Remove mill scale and rust, if present, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Factory Priming for Field-Painted Finish: Immediately after cleaning and pretreating, apply shop primer.

D. Stainless-Steel Finishes:

1. General: Remove tool and die marks and stretch lines or blend into finish.
2. Directional Satin Finish: No. 4 finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate and place formed-metal items level and plumb and in alignment with adjacent construction.
- B. Use concealed anchorages where possible.
- C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.
- D. Wall attachments shall be made to concealed wood blocking.
- E. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

END OF SECTION 055800

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood blocking and nailers.
2. Plywood backing panels.
3. Blocking for Owner provided items

B. Related Sections include the following:

1. Division 01 Section 018115 Sustainable Design Requirements Summary
2. Division 6 Section "Finish Carpentry" for interior plywood wall covering

1.2 DELIVERY, STORAGE AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD AND PANEL PRODUCTS, GENERAL

- A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship" for the following:

1. Plywood
2. Oriented Strand Board
3. Blocking
4. Nailers
5. Miscellaneous framing

- B. 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.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Provide dressed lumber, S4S, unless otherwise indicated.
3. Maximum Moisture Content: 19 percent

- C. Wood Structural Panels:

1. Plywood: DCO PS 1
2. Oriented Strand Board: DOC PS 2
3. Factory mark panels according to indicated standard

- D. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWA C2 and AWWA C9 (plywood) except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWA C31 with inorganic boron (SBX)
1. Preservative Chemicals: Copper Azole, CBA-A or CA-B, Wolmanized Natural Select
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood
- C. Mark each treated item with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood sills, blocking, and similar concealed members in contact with masonry or concrete, including slabs on grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWWA C20 (lumber) and AWWA C27 (plywood).
1. Use Interior Type A, unless otherwise indicated
- B. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing and inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat blocking, plywood, plywood backing panels, and items indicated on Drawings

2.4 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. Miscellaneous framing

- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content and any of the following species:
 - 1. Spruce - pine - fir, NLGA
 - 2. Spruce - pine - fir (south) MeLMA, WCLIB or WWPA

2.5 SHEATHING

- A. Sheathing as concealed Blocking: Exposure 1, APA rated, CDX fir, 3/4 inch thick
 - 1. Provide an area of 32 by 32 inches in stud walls for Owner provided items, unless otherwise noted.
 - a. In toilet rooms, provide 5/8 inch thick plywood blocking in entire wall behind baby changing station

2.6 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels. DOC PS 1, Exposure 1, B-C or better, fire retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch nominal thickness, painted black
 - 1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272.
- C. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.
- D. Screws for Fastening Plywood Sheathing to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened. Hilti Kwik-Flex or Elco Dril-Flex; no substitutions, 10-24 x 1 1/4" wafer head #3.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- B. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table 2305.2, "Fastening Schedule" in BOCA's BOCA National Building Code

3.2 WOOD BLOCKING AND NAILER INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking and similar supports to comply with requirements for attaching other construction.
 - 1. Provide 1 1/2 inch thick blocking minimum, for grab bars, doorstops, and handrail supports.
 - 2. Provide 3/4 inch thick plywood covering a minimum of 32 inches square for toilet accessories
 - 3. Recess bolts and nuts flush with surfaces, unless otherwise indicated
- B. Roofing Nailers: Install wood nailers of same total thickness as insulation. Anchor perimeter nailers to substrate in a manner to resist a force of 75 pounds per linear foot in any direction. Top nailer shall be fastened through the lower layers and into metal deck.

END OF SECTION 061000

SECTION 062000 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Plywood wall finish.
 - 3. Shelving.
 - 4. Reinforced fiberglass wall protection systems.
 - 5. Floor bumpers.
 - 6. Aluminum Posts for Plexiglas

1.2 QUALITY ASSURANCE

- A. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards."
 - 1. Quality Grade: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated. When quality grade is not indicated, provide Custom quality grade.
- B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD 01-001, "FSC Principles and Criteria for Forest Stewardship."
 - 1. Interior standing and running trim
 - 2. Interior plywood paneling
 - 3. Shelving

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Store fiberglass reinforced, wall protection materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and out of direct sunlight.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.

- B. Plywood Wall Finish: APA, A-C, A-D, B-C or B-D, Exposure 1, fir species, sanded face; thickness as indicated, made without urea-formaldehyde adhesive.
- C. Softwood Plywood: DOC PS 1, Medium Density Overlay (MDO). Do not use particleboard that contains urea formaldehyde
- D. Particleboard: ANSI A208.1, Grade M-2. Do not use particleboard that contains urea formaldehyde
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
 - 1. Manufacturer: Pionite, Formica, WilsonArt, Nevamar
- F. Pegboard: Masonite perforated hardboard paneling, matte white undercoat finish, 1/4-inch thickness.

2.2 STANDING AND RUNNING TRIM

- A. Lumber Trim: Transparent finish.
 - 1. Species and Grade: Oak
 - 2. Maximum Moisture Content: 15 percent.
- B. Lumber Trim: Opaque finish.
 - 1. Species and Grade: Poplar; A finish; NHLA.
 - 2. Maximum Moisture Content: 13 percent.

2.3 SHELVING

- A. Lumber Shelving: Made from the following material:
 - 1. Softwood Lumber: Kiln dried, No. 2 & Btr grade lumber with 19 percent maximum moisture content and any of the following species:
 - a. Spruce-pine-fir; NLGA.
 - b. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- B. Shelf Supports: Provide in Division 05 Section "Metal Fabrications."

2.4 WALL PROTECTION SYSTEM

- A. Fiberglass Reinforced Wall Panel (FRP): Gelcoat-finished, glass-fiber reinforced panels, Class A, complying with ASTM D 5319; 0.090 inch by 4 foot wide by maximum available lengths to minimize joints; textured pebble finish. PVC inside and outside corners, and H-molding not less than 1-inch wide. Use adhesive and caulking as specified by manufacturer. Screw attachment with cover buttons is not acceptable. Color for panel and molding shall match.
 - 1. Manufacturers:

- a. Basis of Design: FRP, Marlite . Pebbled, unscored finish & smooth, unscored finish
 - b. Kemlite Glasbord, Crane Composites – for solid color, pebbled frp only
- B. Adhesive: Comply with paneling manufacturer's recommendations for non-flammable adhesives. Notched trowel per manufacturer's requirements.
- 1. Kal-Lite FRP/GRP Adhesive.
 - 2. Kemlite Titebond FRP Adhesive.
 - 3. Marlite C-551.
- C. Sealant: Silicone; ASTM C920, Uses M and A; single component, mildew resistant; color to match panels.
- 1. Locations: Toilet Rooms, Deli/Bakery, Janitors Closets, and where indicated.
 - 2. Products:
 - a. 786 MR Silicone; Dow Corning Corporation.
 - b. 898 Silicone; Pecora Corporation.
 - c. Trensil 200; Tremco, Inc.

2.5 Aluminum Posts

- A. Manufacturer: C.R. Laurence Co. Inc.(www.crlaurence.com)
- B. Material: 18” corner (6406318) , center (6404418) and end (6406518) aluminum posts, satin anodized finish

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.
- B. Move FRP panels and accessories into installation space and unpack them to condition panels before installation.

3.2 INSTALLATION, GENERAL

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work.
 - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable. 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.

3.3 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Cope at returns and miter at corners to produce tight-fitting joints. Use scarf joints for end-to-end joints.
- B. Fabricate wall cap to detail. Provide matching wood plugs at exposed screw locations, sanded flush with cap surface.

3.4 PLYWOOD WALL FINISH INSTALLATION

- A. Plywood Wall Finish: Install plywood with top and bottom edges supported. Screw attach to substrate, keeping fasteners in vertical and horizontal alignment, providing neat uniform pattern. Provide supports at joints, keeping adjacent faces flush. Sand surface where splinters and raised grain occurs at screw locations and panel joints.

3.5 SHELVING INSTALLATION

- A. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on supports.
- B. Bolt 2x shelving plank to steel brackets with two carriage bolts per plank at each bracket.

3.6 WALL PROTECTION SYSTEM INSTALLATION

- A. Install FRP paneling according to manufacturer's written instructions. Install panels in one piece, without joints, on walls that do not exceed manufacturer's standard allowable sizes.
- B. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.
- C. Install panels in a full spread of adhesive. Roll panel with laminate roller, removing all trapped air.
- D. Install trim accessories with adhesive. Do not fasten through panels.
 - 1. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.
 - 2. Allow proper clearance for panel expansion and contraction.
- E. Brace wall panels to assure even contact to wall until adhesive has cured.
- F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 062000

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Rigid roof insulation
 2. Rigid wall insulation and perimeter slab
 3. Glass-fiber blanket insulation.
 4. Vapor Retarders

1.2 DELIVERY, STORAGE AND HANDLING

- A. Protect plastic insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.60 lb/cu ft or X 1.30 lb/cu ft, square edge, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass fiber mat faced on both major surfaces; maximum flame-spread and smoke developed indexes of 75 and 450, respectively
1. Thickness: 4 inches, unless otherwise indicated.
- C. Blowing Agent: Insulation selected shall be produced with CFC and HCFC -free blowing agent. Agent shall have an ozone depleting potential of 0.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Unfaced, Glass-Fiber Blanket Insulation - manufactured formaldehyde free: ASTM C 665, Type I (blankets without membrane facing) consisting of fibers, with maximum flame-spread

and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturer: Johns Manville

B. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:

1. 3 5/8 inches thick with an R value of 13
2. 6 inches thick with an R value of 19
3. 8 inches thick with an R value of 25

2.3 VAPOR RETARDER

A. Provide clear polyethylene 6 mil. Vapor retarder with 0-.1 permance per STM C755

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
- B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.3 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal open joints between foam-plastic insulation units with foam-in-place sealant.
- C. Install glass-fiber insulation 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 cavity, 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. Coordinate the installation of insulation into voids while light gage framing is being installed that would not be accessible after framing is in place.
 - 4. Attach insulation in stud cavity to prevent settling.
- D. Stuff glass-fiber loose-fill insulation into miscellaneous voids and into cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. Ft.

3.4 INSTALLATION OF RIGID INSULATION (INTERIOR OF WALLS)

- A. Board Insulation on Walls: Extend insulation in thickness indicated to cover entire wall. Butt board edges and ends tightly. Butt insulation to window units and blocking.

3.5 INSTALLATION OF RIGID ROOF INSULATION (METAL ROOFING)

- A. Coordinate installing standing seam roof system components so insulation is not exposed to precipitation or left exposed at the end of the work day.
- B. Install insulation with long joints on insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
- C. Mechanically fasten polyisocyanurate insulation to metal roof deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal deck.
 - 1. Fasten insulation at a rate of 1 fastener per 4 sq. ft. of surface area. In no case shall there be less than 2 fasteners per piece of insulation.

3.6 INSTALLATION OF FOAM-IN-PLACE INSULATION

- A. General: Apply foam-in-place insulation sealant to a minimum depth of 1 inch, sealing roof deck flutes and construction cracks and gaps where outside air and cold can infiltrate, providing an airtight building envelope.

3.7 INSTALLATION OF VAPOR RETARDERS

- A. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated.
 - 1. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs at corners and vertical obstructions, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
 - 2. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- B. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- C. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.8 INSULATING STEEL DOOR FRAMES

- A. Exterior Frames: Steel door frames in exterior walls shall be filled with insulation. Cut rigid insulation slab the full width of frame throat and insert continuous slab into door frame head and jambs before frame is installed. After frame is installed, fill remaining gap between rigid insulation and air/vapor barrier with foam-in-place insulation.

END OF SECTION 072100

SECTION 075400 - THERMOPLASTIC MEMBRANE ROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes mechanically fastened membrane roofing systems, including roof insulation and accessories.

1.2 PERFORMANCE REQUIREMENTS

- A. Roofing assembly must be in compliance with an assembly that has been successfully tested by a qualified testing agency to resist the design uplift pressure calculated according to:
 - 1. American Society of Civil Engineers (ASCE)
 - 2. International Building Code (IBC)

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products, with a minimum of 5 years' experience installing the specified system.
- B. Source Limitations for Roofing Products: Obtain components for membrane roofing system from or approved by roofing membrane manufacturer.
- C. Source Limitations for Insulation Products: Obtain roof insulation from a single source approved by roofing manufacturer for use with roofing system for a total system warranty.
- D. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 4. Review structural loading limitations of roof deck during and after roofing.
 - 5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 6. Review temporary protection requirements for roofing system during and after installation.

- a. Establish monitoring procedures for construction activities and recording of damage by sub-trades.
7. Review roof repair procedures after roofing installation.
8. Temporary Protection

1.4 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Substrate Conditions: Do not begin roofing installation until substrates have been inspected and are determined to be in satisfactory condition. Surfaces shall be smooth, dry, clean, free of fins or sharp edges, loose or foreign materials, oil or grease. No work shall proceed when moisture is present on roof or in substrate materials.
- C. Temporary Waterstops: Install at end of each workday and remove before proceeding with next day's work.
- D. Take precautions to prevent drains from clogging during roofing application. Remove debris at completion of each day's work and clean drains, if required. At completion, test drains to ensure system is free running and drains are watertight. Remove strainers and plug drains in areas where work is in progress. Install flags or other telltales on plugs. Remove plugs each night and screen drain.
- E. If exterior walls are not erected at time of membrane installation, envelop flutes of metal deck to prevent moisture intrusion and wind damage.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form, "Total System Warranty" without monetary limitation (NDL), in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within 10 years from date of Substantial Completion. Failure includes roof leaks.
 1. In addition to the 10 year system warranty, provide 20 year roofing membrane warranty.
 2. Warranty from membrane manufacturer shall include wind speed covered up to 72 mph as measured 10 meters above grade.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 THERMOPLASTIC POLYOLEFIN ROOFING MEMBRANE

- A. Fabric-Reinforced Thermoplastic Polyolefin (TPO) Sheet: Uniform, flexible sheet formed from a thermoplastic polyolefin, internally fabric or scrim reinforced, and as follows:
 - 1. Products:
 - a. Sure-Weld Roofing System; Carlisle SynTec Incorporated.
 - b. UltraPly TPO Roofing System; Firestone Building Products Company.
 - 2. Thickness: 60 mil, nominal.
 - 3. Exposed Face Color: Tan

2.3 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard bonding adhesive for membrane and base flashings. Provide adhesives that will withstand Project wind uplift requirements.
- D. Adhesives and Cleaners: Provide bonding adhesive, edge sealant, water cut-off mastic, splicing cement, sealer, and membrane cleaner specifically formulated by the roofing manufacturer for the intended purpose and as required for a complete roof system. Provide adhesives that comply with project requirements for wind uplift force.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening membrane to substrate, and acceptable to membrane 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, termination reglets, cover strips, slip sheet, and other accessories.
- G. Roof walkways shall be pre-molded walkways as supplied by the membrane manufacturer.
- H. Termination Bar: Attaches and seals flashing terminations. Install water block seal behind top of flashing. Anchor bar through pre-punched holes at a rate to maintain a seal (max. 12" o.c.) Remove excess flashing material above bottom of lap sealant reservoir channel. Install lap sealant into reservoir channel.

2.4 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces. Provide 2 layers of 2 inch thick insulation for a total thickness of 4 inches, except as otherwise noted.

1. Insulation at canopies shall be 2.5 inches thick.
 2. Provide insulation approved by roofing manufacturer for a total system warranty.
- B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches, unless otherwise indicated.
1. Tapered insulation shall be manufactured by same manufacturer of board roof insulation.
- C. Provide preformed saddles, crickets, tapered edge strips, back tapered insulation and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.5 FASTENERS AND PLATES

- A. Membrane Fasteners: A heavy duty #15 threaded fastener with Electro-Deposition Coating used for membrane securement into 22 gauge minimum steel deck.
- B. Insulation Fasteners: A #12 threaded fastener with #3 phillips head used for insulation attachment only into steel deck
- C. Membrane Plate: A 2 3/8" diameter metal barbed fastening plate with an oversized hole for use with membrane fastener for membrane securement.
- D. Insulation Fastening Plate: A nominal 3" diameter metal plate used for insulation attachment with appropriate insulation fastener.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 3. Verify that surface plane flatness and fastening of steel roof deck comply with requirements in Division 5 Section "Steel Deck."
 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.

- D. Install insulation in two layers under area of roofing to achieve required thickness. Install layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 12 inches in each direction with no gaps, to form a complete thermal envelope.
- E. Mechanically Fastened Insulation: Install both layers of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Fasten insulation according to requirements established by ASCE-7 wind calculations, but in no case provide less than 5 fasteners per 4' x 8' board dimension.
 - 3. Tapered insulation shall be mechanically attached using same procedures noted above.

3.3 MECHANICALLY FASTENED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing membrane without stretching and allow to relax before installing.
- B. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- C. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions 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 roofing membrane per manufacturer's requirements.
 - 2. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
 - a. Cut out and repair membrane defects at the end of each day's work.
- D. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.
- E. In-Splice Attachment: Secure one edge of roofing membrane using fastening plates centered within membrane splice and mechanically fasten roofing membrane 6" on center to roof deck. Field-splice seam.
- F. Perimeter membrane areas left exposed prior to fascia installation shall either be fully adhered to the vertical face or retained by a continuous cleat. Membrane shall extend down wall at least 1 inch past bottom of the wood nailer, lapping over the wall finish, but not exposed below the flashing.

3.4 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

- B. Flashing of parapets, curbs, expansion joints and other parts of roof must be performed using TPO reinforced membrane.
- C. Flash all projections including pipes, conduits, and curbs passing through the membrane.
 - 1. Flash pipes and conduits with pre-molded cone type flashing boots. Do not field fabricate pipe flashing.
- D. Base Flashing: Tops of elastomeric base flashing shall be secured with a continuous aluminum termination bar and counterflashed.
- E. All vertical flashings and membranes shall be adhered to substrates regardless of height.
- F. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- G. Flash penetrations and field-formed inside and outside corners with sheet flashing. A minimum overlap of 3-inches is required.
- H. Clean seam areas and overlap and firmly roll sheet flashings into the adhesive. Weld side and end laps to ensure a watertight seam installation.

3.5 WALKWAY INSTALLATION

- A. Roof Walkways: Install walkway products in locations indicated. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions. Install roof walkways at all traffic concentration points (such as roof hatches, access doors, rooftop ladders) and all locations as identified on Drawings and as required by manufacturer for obtaining warranty.
 - 1. Walkways shall be installed not more than 2 inches from curbs; and shall be installed with a gap of not more than 3 inches between pads.

3.6 FIELD QUALITY CONTROL

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect and Owner.
- B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

3.7 PROTECTION

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

END OF SECTION 075400

SECTION 078413 - PENETRATION AND JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Joints in fire-resistance rated walls and floors
 - 3. 2" Speed Stipes (1 hour) for roof decking

1.2 SUBMITTALS

- A. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product test reports.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by UL.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems bearing marking of qualified testing and inspection agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Grace Construction Products.
 2. 3M Fire Protection Products.
 3. Tremco, Inc.; Tremco Fire Protection Systems Group.
 4. USG Corporation.
 5. Hilti USA

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping and firestop joint spray that is produced and installed to resist spread of fire according to requirements indicated, resist 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.
- B. Penetrations in Fire-Resistance-Rated Walls: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. Provide fire-resistive joint system products that are compatible with one another, with the substrates forming openings, under conditions of service and application, as demonstrated by fire-resistive joint system product manufacturer based on testing and field experience.
- E. Provide 2” Speed Stipes for roof decking – Hilti CP 767; Item No. 00374507
- F. Comply with Manufacturer’s instructions for use and installation.
- G. VOC Content: Provide penetration firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- H. 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 manufacturer and approved by qualified testing and inspecting agency for firestopping 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. Install penetration firestopping 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 fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- D. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve the fire-resistance ratings indicated.
 - 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. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. 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. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- B. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.4 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestopping for Metallic Pipes, Conduit, or Tubing:
 - 1. UL-Classified System: W-L- 1003, F-rating.
- C. Firestopping for Nonmetallic Pipe, Conduit, or Tubing:
 - 1. UL-Classified Systems: W-L-2002, F-rating.
- D. Firestopping for Electrical Cables:
 - 1. UL-Classified Systems: W-L-3076, for MC cable, F-rating.
 - 2. UL-Classified Systems: W-L-3011, for telephone cable, F-rating.
- E. Firestopping for Insulated Pipes:
 - 1. UL-Classified Systems: W-L-5040, F-rating.
- F. Firestopping for Miscellaneous Mechanical Penetrants:
 - 1. UL-Classified Systems: W-L-7125, F-rating.
- G. Firestopping for Groupings of Penetrants:
 - 1. UL-Classified Systems: W-L-8065, F-rating.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes joint sealants for the following applications, including those specified by reference to this Section.
 - 1. Interior joints in vertical surfaces and horizontal nontraffic surfaces
 - 2. Interior joints in vertical surfaces and horizontal nontraffic surfaces
- B. RELATED SECTIONS
 - 1. Section 018115 Sustainable Design Requirements Summary for VOC limits

1.2 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorated joint substrates.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer with a minimum of three years of documented experience installing joint sealants similar in materials, design, and extent to that indicated for Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Mockups: Install sealant joints in masonry sample panel, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.4 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F
 - 2. When joint substrates are wet
 - 3. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.
- B. Joint Width Conditions: Do not proceed with installation of joint sealant until contaminants capable of interfering with their adhesion are removed from joint substrates.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's and Installer's standard form in which warrantor agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period, including failure to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or does not cure.
1. Warranty Period: 3 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 Articles.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

2.3 ELASTOMERIC JOINT SEALANTS, GENERAL

- A. Elastomeric Sealant: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class and uses related to exposure and joint substrates.
- B. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600

2.4 JOINT SEALANTS

- A. Type 1 - General Purposed Exterior Sealant: Polyurethane, ASTM C920, Type S, Grade NS, Class 25, Single-component.
 - 1. Sonolastic NP-1; Sonneborn, Division of ChemRex Inc.
 - 2. Dymonic; Tremco, Inc.
 - 3. Sikaflex-1a; Sika Corporation, Inc.
 - 4. Dynatrol 1; Pecora corporation.
 - 5. Polymeric Systems, Inc.
 - 6. Schnee-Morehead, Inc.
 - 7. Vulken 116; Tremco, Inc.
 - 8. Tremco Incorporated.
 - 9. Chem-Calk 900; Bostic Findley
- B. Type 2 - General Purpose Exterior Sealant: Polyurethane; ASTM C920, Type M, Grade NS, Class 25; two component
 - 1. Sonolastic NP-2; Sonneborn, Division of ChemRex, Inc.
 - 2. Dymeric 240/240FC; Tremco, Inc.
 - 3. Sikaflex-2c NS; Sika Corporation, Inc.
 - 4. Dynatrol 2; Pecora Corporation
 - 5. Vulken 922; Tremco Inc.
 - 6. Chem-Calk 500, Bostik-Findley
- C. Type 3 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, single component, paintable.
 - 1. Tremflex 834; Tremco Inc.
 - 2. AC-20+, Pecora Corporation
 - 3. Chem-Calk 66, Bostik Findley
- D. Type 4 - Plumbing Fixture/Tile Sealant: Silicone; ASTM C920, Uses M and A; single component, mildew resistant, color selected by Architect.
 - 1. Sanitary SCS 1700; GE Silicone
 - 2. 898 Silicone; Pecora Corporation
 - 3. 786 MR Silicone; Dow Corning Corp.
 - 4. Tremsil 200; Tremco, Inc.

- E. Type 5 - Interior Sealant for Food Service Areas: Elastomeric; ASTM C 920; Type S, Grade NS, Class 25, Use NT. Provide elastomeric sealant NSF certified for end-use application indicated. Provide sealant that, when cured and washed, meets requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food.

2.5 JOINT SEALANT BACKING

- A. General: Provide sealant backings (backer rods) of material and type that are nonstaining; are compatible with joint substrates, primers and other joint fillers, and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers (Backer rods): Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - 1. Closed-cell polyethylene foam, non-absorbent to liquid water and gas, non-outgassing in unruptured state
 - 2. Joint Fillers (backer rods) shall be oversized 40 percent larger than joint width
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent non-porous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance

- B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of work shall constitute acceptance of substrate as acceptable for installation of sealants.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant
 - a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - 2. Remove laitance and form-release agents from concrete.
 - 3. 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 of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- 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.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- C. 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.
- D. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- E. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.4 JOINT-SEALANT SCHEDULE

- A. Control, Expansion and Soft Joints in Masonry and Between Masonry and Adjacent Work: Type 2 colors as selected.
- B. Control, Expansion and Soft Joints Between EIFS and Adjacent Work: Type 2, colors as selected
- C. Under Exterior Door Thresholds: Type 1
- D. Exterior Joints for Which no other Sealant type is indicated: Type 2, colors as selected
- E. Concealed Interior Perimeter Joints of Exterior Openings: Type 1
- F. Exposed Interior Perimeter Joints of Exterior Openings: Type 3, colors as selected
- G. Interior Ceramic tile Expansion, Control, Contraction, and Isolation Joints in horizontal Traffic surfaces: Type 2, color as selected.
- H. Joints between Plumbing fixtures and walls and floors and Between countertops and walls: Type 4; colors as selected
- I. Interior Joints in Food Service Areas: Type 5, colors as selected
- J. Interior Joints for Which No Other Sealant is Indicated: Type 3, colors as selected.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hollow metal doors and frames.
2. Hollow metal borrowed lites.

B. Related Work:

1. Division 01 Section 018115 "Sustainable Design Requirements Summary"
2. Division 4 Section "Unit Masonry Assemblies" for building anchors into and grouting hollow metal frames in masonry construction
3. Division 8 Section "Glazing" for glazed lites in hollow metal doors, frames, and borrowed lites.
4. Division 8 Section "Door Hardware" for door hardware and weatherstripping for hollow metal doors.
5. Division 9 Section "Painting" for field painting hollow metal doors and frames.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- G. Mineral-Fiber Insulation: ASTM C 665, Type I.
- H. Glazing: Division 08 Section "Glazing."
- I. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat.

2.3 HOLLOW METAL DOORS

- A. General: Comply with ANSI/SDI A250.8.
 1. Design: Flush panel.
 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection ratings indicated.
 - b. Thermal-Rated (Insulated) Doors: R-value of not less than 12.3 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
 3. Vertical Edges for Single-Acting Doors: Beveled edge, 1/8 inch in 2 inches.
 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- thick, end closures or channels of same material as face sheets.
 5. Tolerances: SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Comply with ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
 2. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless).
- D. Hardware Reinforcement: ANSI/SDI A250.6. Fabricate reinforcement plates of sufficient strength from same material as door face sheets to support hardware without through bolting.

2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as full profile welded unless otherwise indicated.
 - 3. Frames for Level 3 Steel Doors: 0.053-inch- thick (16 gage) steel sheet.
 - a. Frames for Openings 48 inches wide or greater: 0.067 inch thick (14 gage) steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Fabricate frames as knocked down for gypsum board partitions and face weld for masonry openings.
 - 3. Frames for Level 2 Steel Doors: 0.053-inch- thick (16 gage) steel sheet.
 - a. Frames for Openings 48 inches Wide or Greater: 0.067 inch thick (14 gage) steel sheet.
 - 4. Frames for Wood Doors: 0.053-inch-(16 gage) thick steel sheet.
 - 5. Frames for Borrowed Lights: 0.042-inch- thick (18 gage) steel sheet.
 - 6. All welded joints shall be ground and dressed to be smooth, flush, and invisible.
 - 7. Fabricate frames in masonry walls for coursing with 4-inch head member.
- D. Hardware Reinforcement: ANSI/SDI A250.6. Fabricate reinforcement plates of sufficient strength from same material as frames to support hardware without through bolting.
 - 1. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot rolled steel sheet.
 - 2. Closer reinforcement: Each door frame shall receive reinforcing for door closer, whether door is scheduled to receive closer or not.
 - 3. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick (28 gage) steel sheet to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

2.5 FRAME ANCHORS

- A. Supports and Anchors: Fabricated from not less than 0.042 inch thick (18 gage) electrolytic zinc-coated or metallic coated steel sheet.
- B. Jamb Anchors:
 - 1. Masonry Type: T-shaped anchors to suit frame size, not less than 0.042 inch thick, (16 gage) with corrugated or perforated straps not less than 2 inches wide by 10 inches long.
 - 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 (16 gage) inch thick.

3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors permitted for existing gypsum board walls only.
 4. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location. Dimple frame to permit filling screw head location flush with surrounding frame.
- C. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick (18 gage), and as follows:
1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick (20 gage), same material as door face sheet.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick (20 gage), same material as frames.
- D. Astragals: Provide T-shaped astragals for double doors, fabricate from 0.053 inch thick (16 gage) steel sheet.
 1. Astragals at fire-rated doors shall comply with NFPA 80 to provide fire ratings indicated.

2.7 LOUVERS

- A. Provide sightproof louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick (26 gage), cold-rolled steel sheet set into 0.032-inch-thick (20 gage) steel frame.

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

2.9 FABRICATION

- A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- B. Hollow Metal Doors:
 1. Exterior Doors: Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053 inch thick (16 gage) metallic-coated steel channels with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.

2. Pairs of Doors: Sizes of pairs of doors to provide maximum 3/16 inch gap between leafs to permit proper functioning of deal latching hardware features
 3. Glazed Lites: Factory cut openings in doors.
- C. Hollow Metal Frames: Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 - c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.
 - a. Single-Door Frames: Three door silencers.
 - b. Double-Door Frames: Two door silencers.
 7. Provide welded frames with temporary spreader bars for shipping.
- D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.

2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 electrical Sections.
- E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 3. Provide loose stops and moldings on inside of hollow metal work.
 4. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: ANSI/SDI A250.10.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling and dressing, as required to make repaired area smooth, flush and invisible on exposed faces.
- B. Paint backside of hollow metal frames to be set in masonry with bituminous coating.
- C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.
- D. Hollow Metal Frames in exterior walls shall be filled with rigid insulation before installing. Coordinate preparation and installation of insulation with requirements of Division 7 Section " Building Insulation."

3.2 INSTALLATION

- A. Hollow Metal Frames: Comply with ANSI/SDI A250.11
1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

- a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in section because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove shipping straps at bottom of frames. Properly space frame using wood template that is full depth of frame and of proper spacing width during setting and anchoring of frames to maintain proper width, with frame plumb and square without twists. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 3. Metal Stud Partitions: Attach wall anchors to studs with screws. Provide floor anchor at each jamb, in addition to the wall anchors.
 4. Masonry Walls: Anchors shall be masonry T-shaped anchors. Provide floor anchor at each jamb, in addition to the wall anchors. Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout
 5. In-Place Concrete or Masonry construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush and invisible on exposed faces.
 6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- B. Hollow Metal Doors: fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary
1. Non-fire rated steel doors
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch
 - b. Between edges of pairs of doors: 1/8 inch plus or minus 1/16 inch
 - c. Between bottom of door and top of threshold: Maximum 3/8 inch
 - d. Between bottom of door and top of finish floor (no threshold): maximum 3/4 inch
 2. Fire Rated doors: Install doors with clearance according to NFPA 80.
 3. Smoke-Control Doors: Install doors according to NFPA 105
 4. Pairs of Doors: Install pairs of doors to provide maximum 3/16 inch gap between leaves and accurate alignment of strike to permit proper functioning of dead latching feature.

- C. Glazing: Comply with installation requirements in Division 8 Section "Glazing" and with hollow metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat-or-oval lead machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.3 ADJUSTING AND CLEANING

- A. Final Adjustments:. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off hollow metal doors and frames immediately after installation
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing - flush wood doors
3. Factory fitting flush wood doors to frames and factory machining for hardware

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated" and WDMA.1s.10A Architectural Wood Flush Doors."

C. Forest Certification: Provide doors made with all wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.3 DELIVERY, STORAGE AND HANDLING

A. Protect wood doors during transit, storage, and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standard, manufacturer's instructions, and recommendations of WDMA 1.S.1A, Appendix, "How to Store, Handle Finish, Install and Maintain Wood Doors."

B. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard from in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a. Warping (bow, cup, or twist) more than 1/4 inch in a 42- by-84-inch section.

- b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
2. Warranty Period for Solid-Core Interior Doors: 2 years from date of substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Algoma Hardwoods, Inc.
 2. Lambton Doors.
 3. Marshfield Door Systems, Inc.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade:
 1. Heavy Duty.
- C. Particleboard-Core Doors:
 1. Particleboard: ANSI A208.1, Grade LD-2.
 2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
- D. Mineral-Core Doors:
 1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
 2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
 3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Solid-Core:
 1. Grade: Custom (Grade A faces).

2. Species: white birch.
3. Cut: Rotary cut.
4. Match between Veneer Leaves: Book or Slip match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Core: Particleboard.
8. Construction: Five plies, bonded construction

2.4 LIGHT FRAMES

- A. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 1. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
- C. Openings: Cut and trim openings through doors in factory.
 1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

- A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated," Section 1500, for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- B. Transparent Finish:
 1. Grade: Custom.
 2. Finish: WDMA TR-6 catalyzed polyurethane.
 3. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that frames comply with indicated requirements for type, size, location and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 08 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - 1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements.

END OF SECTION 081416

SECTION 083819 - TRAFFIC DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes double acting, self-closing impact traffic doors.
- B. Related Sections:
 - 1. Division 05 Section "Metal Fabrication" for channel and tube door frames.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors in wrapped or crated packages to provide protection during transit and job storage.
- B. Color chart and color chip samples
- C. Store doors in upright position under cover in a secure location.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Chase Industries, Chase Doors, Cincinnati, OH (800) 543-4455

2.2 HIGH IMPACT TRAFFIC DOORS

- A. High Impact Traffic Doors: Cross-linked polyethylene, 0.125 inch thick, on high strength core with internal reinforcement; include mounting hardware.
 - 1. Door Thickness: 1-1/2 inches.
 - 2. Window Size: Use standard sizes closest to the following:
 - a. Doors 30 Inches Wide: 16- by 16 inches.
 - b. Doors 36 Inches Wide or Wider: 23- by 23-inches.
 - 3. Glazing: Polycarbonate
 - 4. Model: Durulite Retailer
- B. Door Hardware and Seals:
 - 1. Hinges: Heavy-duty, double-action pivot hinges with 9 inch lower hinge jamb guard, 125 degree swing unless indicated otherwise.
 - 2. Seals:

- a. Head and Jamb: Polymer impregnated, woven nylon fabric in hollow-loop configuration. Jamb seals factory installed and fixed; head seal field installed and adjustable.
- b. Sill: Neoprene rubber, 1/16 inch thick, factory installed and fixed.
- c. Provide fully gasketed doors at coolers and freezers.

C. Door Accessories:

- 1. Bumpers: "D" shaped bumper, 1/4-inch thick, 30 inches high, both sides.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings before installation of doors. Verify that frames are correct type; are square and plumb; and have been installed as required for the proper hanging of corresponding doors.
- B. Proceed with installation only after unsatisfactory conditions have been corrected. Commencement of installation shall indicate acceptance of door opening conditions.

3.2 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions.

3.3 ADJUSTING

- A. Rehang or replace doors that do not swing or operate freely without binding.
- B. Check seals for proper fit.

END OF SECTION 083819

SECTION 087100 - DOOR HARDWARE – NOTE: ALL SPARE PARTS FOR DOOR HARDWARE SHOULD BE STORED FOR OWNER FOR USE WHEN INSTALLING CORES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Commercial door hardware
2. Cylinders for doors specified in other Sections
3. Electrified door hardware

B. Related Sections include the following:

1. Division 08 Section "Overhead Coiling Doors" "Sectional Doors" for slide bolts to receive padlocks.
2. Division 08 Sections "Grille" for locking bolts to receive cylinders.
3. Division 08 Sections "Sliding Automatic Entrances" for locks to receive cylinders.

1.2 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.

B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency, acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.

1. Test Pressure (Positive Pressure): After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.

1.3 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.

2.2 HINGES

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Hager Companies.
 - b. McKinney Products Company; an ASSA ABLOY Group company.
 - c. Stanley Commercial Hardware; Div. of The Stanley Works.

PART 3 - PRODUCTS

3.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.

3.2 HINGES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hinges:
 - a. Hager Companies.
 - b. McKinney Products Company; Div. of ASSA ABLOY Group
 - c. Stanley Commercial Hardware; Div. of The Stanley Works.
- B. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - 1. Exterior Hinges: Stainless steel, with stainless-steel pin.
 - 2. Interior Hinges: Steel, with steel pin.
 - 3. Fire Rated Hinges: Steel, ball bearing
- C. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for outswinging exterior doors and outswinging interior doors with locks.
- D. Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches)	
		Standard Weight	Heavy Weight
40 and under by 1-3/4	4-1/2	0.134	0.180
Over 40 by 1-3/4	5	0.146	0.190

- E. Hinge Weight: Unless otherwise indicated, provide the following:
1. Entrance Doors: Heavy-weight ball-bearing hinges.
 2. Doors with Closers: Standard-weight ball bearing hinges.
 3. Interior Doors: Standard-weight hinges, oil-impregnated bearings unless specified otherwise.
- F. Quantity: Provide the following, unless otherwise indicated:
1. Two Hinges: For doors with heights up to 60 inches.
 2. Three Hinges: For doors with heights 61 to 90 inches.
 3. Four Hinges: For doors with heights 91 to 120 inches.
- G. Self-Closing Hinges: Standard-weight adjustable spring hinge. Provide door leaf with minimum of two self-closing hinges and one ball-bearing hinge.

3.3 CONTINUOUS HINGES

- A. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves; joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings. Standard duty concealed hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame. UL listed for indicated fire rating.
1. Manufacturers:
 - a. Hager Companies.
 - b. McKinney Products Company; an ASSA ABLOY Group company.
 - c. Select Products Limited.

3.4 CYLINDRICAL LOCKS, LATCHES, AND DIGITAL LOCKSETS

- A. Bored Locks: BHMA A156.2, Grade 1 Heavy duty; Series 4000, interchangeable core to receive 6 pin Best cores. Lever shall be a minimum of 3-1/2 inches long, with an angle return, and a minimum of 2 9/16 inch Rose. Furnish locks with construction cores. Permanent cores provided by Owner.
1. Manufacturers:
 - a. Arrow USA; an ASSA ABLOY Group company, Q Series,
 - b. Best Access Systems; Div. of The Stanley Works, 93K Series.

- c. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company, CL3300 Series.
2. Cylindrical locks functions shall be as scheduled to the following:

<u>FUNCTION</u>	<u>OPERATION</u>
I (Storeroom Function)	Outer lever fixed. Entrance by key only. Inner lever always free.
II (Office Function)	Turn-button locking-pushing and turning button locks outside lever requiring use of key at all times until button is manually restored to unlock position. Push button locking- pushing button locks outside lever until unlocked with key or inside lever is turned.
III (Passage function)	Both levers always free

B. DIGITAL LOCKSETS

- 1. Manufacturer: Alarm Lock, Trilogy Model T2, DL2700/IC.
 - a. Locksets shall be ANSI, A156.2 series 4000, Grade 1 heavy duty.
 - b. Self-contained, fully programmable, 12 digit metal keypad.
 - c. Lever handles with interchangeable core to receive Best cylinder.
- 2. Manufacturer: Schlage Electronic Security KP2000E (Hannaford To Go)
 - a. Locksets shall be ANSI, A156.2 series 4000, Grade 1 heavy duty.
 - b. Access credential option- KPI, Keypad iButton Reader
 - c. Lever handle (standard)
 - d. Schlage Everest cylinder (KD)- satin chrome finish.

3.5 DOOR BOLTS

- A. Surface Bolts: Wrought steel, polished and plated, 8 inches long, 1-3/16 inch throw, 1-5/16 inch projection. Surface bolt shall accept padlock with 3/8-inch maximum diameter shackle and 1-3/4 inch minimum shackle opening height.
 - 1. Manufacturer:
 - a. IVES Hardware; an Ingersoll-Rand Company; No. SB-360.

3.6 PADLOCK

- A. Padlock with 3/8 inch max. diameter shackle and 1 3/4 inch minimum shackle opening height
 - 1. Manufacturer:
 - a. Best Access Systems, Model No. 11B772 Standard finish

3.7 EXIT DEVICES

- A. Exit Devices for project shall be of the same series and design, and shall be manufactured by one manufacturer.
- B. Exit Devices shall have a continuous horizontal housing and shall be of the same size, and the same configuration, for all doors throughout. Devices shall have one point allen-wrench dogging regardless of function, except for Fire Rated. Provide silver gray paint finish.
- C. Accessibility Requirements: Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- D. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- E. The following is a list of the functions referred to under hardware sets and the model numbers of the acceptable manufacturers.
 - 1. Type R-1
 - a. SARGENT Manufacturing Company; an ASSA ABLOY Group company; 20 Series, Rim Type 2828.
 - b. Von Duprin; an Ingersoll-Rand Company; 22 Series, Rim Type 22EO.
 - 2. Type R-2
 - a. Von Duprin; an Ingersoll-Rand Company; Rim Exit Device type 99EO

3.8 LOCK CYLINDERS

- A. Cylinders: Best E Series, constructed from brass or bronze, complying with the following:
 - 1. Number of Pins: Six.
- B. Permanent Cores: Permanent cores and keying provided by Owner.
- C. Construction Keying: Comply with the following:
 - 1. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

3.9 OPERATING TRIM

- A. Standard: BHMA A156.6.
- B. Push Plates: Beveled 4 sides; fabricated from the following material:
 - 1. Plastic Laminate: 1/8 inch thick; NEMA LD 3, Grade HGS.

2. Color and Texture: Black, unless indicated otherwise.
3. Size: Unless indicated otherwise, provide 8 inches wide by 22 inches high.
 - a. Hager Companies.
 - b. IVES Hardware; an Ingersoll-Rand Company.
 - c. Rockwood Manufacturing Company.

C. Straight Pulls: ADA compliant, 1 inch diameter solid stainless steel round bar.

1. Size: Unless indicated otherwise, provide 10 inches center to center, with 3 1/2 inch projection and 2 1/2 inch clearance.
 - a. Hager Companies, H4J.
 - b. IVES Hardware; an Ingersoll-Rand Company; 8103EZ.

D. Flush Pulls: 6 inch by 6 inch, anti-vandal flush pull.

1. Trimco BBW; 1111C.

3.10 CLOSERS

A. Accessibility Requirements: Comply with the following maximum opening-force requirements:

1. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
2. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations 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.

D. Surface Closers:

1. All door closers for this project shall be the product of one manufacturer. Door closers shall be full rack-and-pinion type with cast aluminum body.
2. Closers shall be surface mounted (with mounting screws exposed). Closers mounted to hollow doors shall be through bolted.
3. Closers shall be non-handed to permit installation on either hand door, and supplied with a standard show and soffit plate to allow regular arm, parallel arm or top jamb mounting.
4. Hydraulic fluid shall be non-gumming and non-freezing.
5. Closer shall have a combination non-critical regulating valve to adjust both the sweep and the latch speed. Closer to have adjustable backcheck cushioning.
6. The regular and top jamb non-hold-open arm show shall permit a 15 percent adjustment (+/- 7- 1/2%) by relocation of the forearm pivot.
7. Closer shall be enclosed in a full molded cover.

8. Hardware contractor shall insert in the hardware schedule, beside each door listing, the required degree of opening for each door. If the door swing is over 140 degrees, parallel arm type closers shall be used. Door closers mounted on brackets, or top jamb application, shall not be permitted.
9. Installing contractor shall be responsible for proper installation of door closers in accordance with degree of opening indicated on hardware schedule. Adjustment of all valves, for proper control of closing speed, latching speed, delayed action, backcheck, and spring power adjustments, shall be the responsibility of the installing contractor.
10. Manufacturers:
 - a. DORMA Architectural Hardware; Member of The DORMA Group North America; 8916 Series.
 - b. Norton Door Controls; an ASSA ABLOY Group company; Series 8501/8501BF.
 - c. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company; 3501/3501BF Series.
 - d. LCN (Hannaford To Go) 9542 series

3.11 PROTECTIVE TRIM UNITS

- A. Kick Plates: BHMA A156.6; beveled 4 sides; fabricated from the following material:
 1. Plastic Laminate: 1/8 inch thick; NEMA LD 3, Grade HGS.
 2. Color and Texture: Black, unless indicated otherwise.
 3. Size: Unless indicated otherwise, provide 16 inches high by 1-1/2 inches less door width for single doors and 1 inch less door width for pairs.
 - a. Hager Companies.
 - b. IVES Hardware; an Ingersoll-Rand Company.
 - c. Rockwood Manufacturing Company.

3.12 STOPS AND HOLDERS

- A. Stops and Bumpers: Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders. Provide door stops for all doors in accordance with the following requirements.
 1. Wall type bumpers with a concealed type flange shall be used wherever possible and shall be one of the following:
 - a. Hager Companies; 236W.
 - b. IVES Hardware; an Ingersoll-Rand Company; 407 ½.
 - c. Rockwood Manufacturing Company; 409.
 2. Where wall type bumpers cannot be used, such as on unreinforced partitions or in situations where door comes in contact with materials such as glass, provide dome type floor stops of the proper height.
 - a. Hager Companies; 241F, 243F.
 - b. IVES Hardware; an Ingersoll-Rand Company; 436, 438

- c. Rockwood Manufacturing Company; 440, 442.
- 3. Exterior doors striking masonry and other doors specified to have door stops and holders shall have cast bronze wall or floor type door stops holders with hook or staple to engage door and to selectively hold in open position.
 - a. Hager Companies; 268, 256.
 - b. IVES Hardware; an Ingersoll-Rand Company; 445, 446
 - c. Rockwood Manufacturing Company; 473, 477.
- B. Door Holders: Kick-down door stop, resilient non-marring tip.
 - 1. Hager Companies; 270D.
 - 2. IVES Hardware; an Ingersoll-Rand Company; 452.
 - 3. Rockwood Manufacturing Company; 461.
- C. Silencers for Door Frames: BHMA A156.16, Grade 1; neoprene or rubber; fabricated for drilled-in application to frame.

3.13 DOOR GASKETING

- A. Standard: BHMA A156.22.
- B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 - 1. Perimeter Gasketing: Premium quality pressure sensitive silicone rubber gasketing, teardrop shape with factory applied adhesive backing. Apply to head and jambs at locations on frame as recommended by manufacturer, concealed when door is in a closed position, forming seal between door and frame.
 - a. Hager Companies, 726S
 - b. National Guard Products, 5050.
 - c. Pemko Manufacturing Co., S88.
 - d. Reese Enterprises, 797
 - e. Zero International, 188S
 - 2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 - 3. Door Bottoms: Anodized Clear Aluminum, Door Sweep Weatherstrip, Nylon Brush Insert, 2-1/16 inches x 3/8 inch. Apply to bottom of door, forming seal with threshold when door is closed.
 - a. Hager Companies, 801S
 - b. National Guard Products, D608A.
 - c. Pemko Manufacturing Co., 18100CNB.
 - d. Reese Enterprises, 967C.

- C. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke-labeled gasketing on rated doors and on smoke-labeled doors.
 - 2. Same product and configuration specified for perimeter gasketing.

3.14 THRESHOLDS

- A. Standard: BHMA A156.21, extruded aluminum with corrugated surface, 5 inches wide unless indicated otherwise by full width of door opening.
 - 1. Fasteners: Stainless steel screws, not less than 4 screw anchors for 3 foot lengths.
- B. Accessibility Requirements: Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

3.15 STAINLESS STEEL GUIDE RAILS

- A. Stainless steel tubular guide rail fabricated from 1 7/7" stainless steel tube and furnished with a 1/4" Kydex panel and two bumper wheels. Finish to be satin polish. Panel color to be black. Curran Engineering Co. Model # CE-920-F

3.16 MISCELLANEOUS DOOR HARDWARE

- A. Hannaford To Go:
 - 1. Electric Strikes- Hes 7000-24VDC x 783S-628c
 - 2. Electrohydraulic/Pneumatic actuators and accessories
 - a. LCN surface Mount, RF Model #7910-967 actuator
 - b. LCN RF Receiver, Model #7910-931
 - c. LCN Wall Plate Actuator, Model # 7910-952
 - d. Von Duprin Series PS861 power Supply
 - e. Von Duprin Electrical power Transfer and Junction Box
- B. Door Viewer: 160 degree viewer, brass with 26D finish.
 - 1. Hager Companies; 1755.
 - 2. IVES Hardware; an Ingersoll-Rand Company; 698.
 - 3. Rockwood Manufacturing Company; 620.

3.17 FABRICATION

- A. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and

BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

- B. Fasteners: Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Comply with NFPA 80 for fasteners of door hardware in fire-rated applications.
- C. Finishes: BHMA A156.18, and the following:
 - 1. BHMA 626 (US26D): Satin chromium plated over nickel, over brass or bronze base metal.
 - 2. BHMA 630 (US32D): Satin stainless steel, over stainless-steel base metal.

PART 4 - EXECUTION

4.1 INSTALLATION

- A. Steel Doors and Frames: Comply with DHI A115 Series. Drill and tap doors and frames for surface-applied door hardware according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.
- C. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- D. 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 specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- E. Weather-Strip Gasketing Material: Apply gasketing in temperatures above 50 degrees F.
- F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- G. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

4.2 DOOR HARDWARE SETS

Set#12 Beverage Storage

Each leaf shall have hinges: Lockset (II), kickplate, door stop

END OF SECTION 087100

SECTION 092950 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes the following:

1. Interior non-load bearing framing systems (e.g., supports for partition walls, framed soffits, furring, etc.)
2. Interior suspension system (e.g., supports for ceilings, suspended soffits, etc.)
3. Interior gypsum board.
4. Exterior gypsum sheathing
5. Acoustical insulation

B. Related Sections include the following:

1. Division 01 Section 018115 "Sustainable Design Requirements Summary"
2. Division 5 Section "Cold formed Metal Framing" for load bearing steel framing.
3. Division 6 Section "Rough Carpentry" for concealed wood blocking in gypsum board assembly walls.
4. Division 7 Section "Penetration Firestopping" and "Fire-Resistive Joint Systems" for firestopping not included in work of the Section.
5. Division 7 Section "Joint Sealants" for sealants not included in work of this Section.
6. Division 9 Section "Tiling" for preparing tile backer panels to receive tile.
7. Division 9 Section "Painting" for coordination/inspection requirements with painting contractor and primers applied to gypsum board surfaces.

1.2 QUALITY ASSURANCE

- A. Fire Resistance Rated Assemblies: For fire-resistance rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 GYPSUM BOARD, GENERAL

- A. Regional Materials: Gypsum panel products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

2.3 NON-LOAD BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating, unless otherwise indicated.

2.4 SUSPENSION SYSTEM COMPONENTS

- A. Tie Wire: ASTM A 641/A641 M, Class1 zinc coating, soft temper, 0.0625 inch diameter wire, or double strand of 0.0475 inch diameter wire.
- B. Wire Hangers: ASTM A641/A 641 M, Class 1 zinc coating, soft temper, 0.162 inch diameter
- C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (16 gauge) and minimum 1/2 inch wide flanges.
- D. Furring, Framing and Accessories: ASTM C645
 - 1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base Metal Thickness: 22 gage
 - 2. Steel Studs: ASTM C 645
 - a. Minimum Base-Metal Thickness: 25 gage
 - b. Depth: as indicated on Drawings
- E. Grid Suspension System for Ceilings: ASTM C 645, direct hung system composed of main beams and cross-furring members that interlock.
 - 1. Products: Provide one of the following:
 - a. Armstrong World Industries, Inc.; Drywall Grid System
 - b. Chicago Metallic Corp.; Drywall furring system
 - c. USG Corp.; Drywall suspension system

2.5 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645

1. Minimum Base-Metal Thickness: 0.0179 inch (25 gage) minimum, unless otherwise indicated.
 - a. Provide 0.0329 inch (20 gage) minimum thickness at the following locations:
 - 1) For framing at door openings
 - 2) For framing height over 12 feet
 - 3) For 6 inch and greater framing
 - 4) At locations to receive cementitious backer board
 2. Depth: As indicated
- B. Deep-Leg Deflection Track: ASTM C 645 top runner with flanges to allow for 3/4 inch deflection at floors and 2 inch at roofs.
- C. Firestop Deflection Track: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs. Provide deflection track with flanges to allow for 3/4 inch deflection at floors and 1 1/2 inch at roofs.
- D. Radius Track: Factory fabricated runner track, providing smooth, non-segmented continuous one-piece shape.
1. Product: Radius Track Corp. (888) 872-3487
- E. Furring, Framing and Accessories: ASTM C 645
- F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. 0.0598 inch (16 gage) unless indicated otherwise
- G. Z-shaped Furring: With slotted or nonslotted web, face flange of 1 1/4 inches, wall attachment flange of 7/8 inch, minimum bar metal thickness of 0.0312 inch (22 gage) depth as indicated.
- H. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

2.6 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to the type of gypsum board indicated and whichever is more stringent. Provide board from the USG Washingtonville, PA plant to comply with recycled content and regional materials requirements, or product of equal specifications:
1. Manufacturers:
 - a. USG Corp.

- B. Regular type:
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered and beveled.
- C. Type X
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered and beveled
 - 3. Length: Maximum permissible length
- D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch
 - 2. Long Edges: Tapered and beveled
 - 3. Length: Maximum permissible length
 - 4. Mold Resistance: ASTM D 3273, score of 10.
- E. Cementitious Backer Units: ANSI A108.1
 - 1. Product: Hardibacker Cement Board with Moldblock- James Hardie Building Products.
 - 2. Thickness: 1/2 inch
 - 3. Length: Maximum permissible length.

2.7 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047, galvanized steel. Plastic or exposed type trims will not be allowed:
 - 1. Shapes:
 - a. Beadex Brand Paper Faced "L" shape tape-on trim
 - b. LC Bead (Casing): J shaped, 30 gage; exposed long flange received joint compound
 - c. Expansion (Control) Joint: One-piece control joint formed with V-shaped slot and removable strip covering slot opening
 - d. Curved-Edge Cornerbead: With notched or flexible flanges

2.8 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- 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, beveled panel edges, 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 or drying type, all purpose compound.
3. Fill Coat: For second coat, use setting type, sandable topping or drying-type, all purpose compound.
4. Finish Coat: For third coat, use setting type, sandable topping or drying type, all purpose compound.

D. Joint Compound for Moisture Resistant Gypsum Board

1. Use setting type taping compound and setting type, sandable topping compound.

2.9 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Acoustical Insulation: 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.

D. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products:

- a. Pecora Corp.; AC-20 FTR, Acoustical and Insulation Sealant
- b. United States Gypsum Co.; Sheetrock Acoustical Sealant

E. Acoustical Sealant for Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Products:

- a. Ohio Sealants, Inc.; Pro-Series SC-175 Acoustical Sealant
- b. Pecora Corp., AIS-919
- c. Tremco, Inc. Tremco Acoustical Sealant

2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Insulation Support Anchors: Continuous, galvanized metal support strip, 25 gauge, with pre-punched tabs at 8 inches on center.
- G. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."
- H. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."
- I. Firestopping: Provide firestopping where fire rated gypsum board assemblies butt masonry, steel deck, joists, beams, and structural members as part of the gypsum board assembly work. Penetrations through fire-resistance-rated walls and partitions is specified in Division 7 Section "Penetration Firestopping". Mechanical, plumbing, and electrical penetrations through fire resistance rated walls and partitions are specified in Divisions 22, 23 and 28.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that site conditions are ready to receive work and opening dimensions are as instructed by the manufacturer.
- B. Commencement of work signifies acceptance of substrate
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Post-Installation Inspection: Inspect walls for dents and imperfections, with Installer and painter present, prior to painting. Inspect wall again after primer and first coat of paint applied, with Installer and painter present. Installer shall touch-up as follows:
 1. Touch-up visible gypsum board imperfections before priming of walls.
 2. Touch-up imperfections found in field of boards and joints made visible from painting after first finish coat applied
 3. Joint compound touch-up shall be primed and painted before final coat is applied

3.2 FRAMING INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754 and ASTM C 840 requirements that apply to framing installation.
- B. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
 1. Isolate ceiling assemblies where they abut or are penetrated by building structure

2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
 - a. Install deflection firestop track top runner at fire-resistance rated assemblies.

3.3 INSTALLING SUSPENSION SYSTEMS

- A. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- B. Suspend hangers from building structure as follows:
 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or suspension system.
 - a. Splay hangers only where required to miss obstruction and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 3. Do not attach hangers to steel roof deck
 4. Do not attach hangers to permanent metal forms
 5. Do not connect or suspend steel framing from ducts, pipes or conduit
- C. Seismic Bracing: Sway-brace suspension systems if required.
- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- E. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.
- F. Sway-brace suspended steel framing with hangers used for support.
- G. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.
- H. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards
 1. Carrying Channels (Main Runners) 48 inches o.c.
 2. Furring Channels (Furring Members) 16 inches o.c.

- I. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.4 INSTALLING STEEL PARTITIONS AND SOFFIT FRAMING

- A. Install tracks (runners) at floors, ceiling, and structural walls and columns where gypsum board assemblies abut other construction.
- B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 1. Cut studs short of full height to provide perimeter relief for amount of structure deflection indicated. Do not fasten studs to top track to allow independent movement of studs and track.
 2. For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
- D. Install steel studs and furring at the following spacings.
 1. Single-Layer Construction: 24 inches o.c. unless otherwise indicated.
 2. Tile Backing Panels: 16 inches o.c., unless otherwise indicated
- E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open(unsupported) edges of stud flanges first.
 1. Attach both flanges to floor runner track with screws.
- F. Curved Partitions:
 1. Cut top and bottom track (runners) through leg and web at 2-inch intervals for arc length. In cutting lengths of track, allow for uncut straight lengths of not less than 12 inches at end of arcs.
 2. Bend track to uniform curve and located straight lengths so they are tangent to arcs.
 3. Support outside (cut) leg of track by clinching steel strip, 1 inch high by thickness of track metal, to inside of cut legs using metal lock fasteners.
 4. Begin and end each arc with a stud, and space intermediate studs equally along arcs at stud spacing recommended in writing by gypsum board manufacturer to radii indicated. Attach studs to bottom runners with 3/8 inch long pan head framing screws into both flanges. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

5. Premanufactured Runner Option: Provide pre-manufactured radius runners to uniform curve of radius indicated and locate straight lengths so they are tangent to arcs.

- G. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 1. Install two studs at each jamb.
 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2 inch clearance from jamb stud to allow for installation of control joints.
 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above, even when partitions are to full height. Provide diagonal bracing at tall partitions to stop deflection and vibration of studs when doors are slammed shut.
 4. Extend jamb studs one-piece full height.

- H. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

- I. Wall Furring:
 1. Erect wall furring for direct attachment to concrete masonry unit walls.
 2. Erect furring channels vertically. Secure in place to masonry at 16 inches o.c. maximum.
 3. Space furring channels maximum 16 inches o.c., not more than 4 inches from floor and ceiling lines and abutting walls.

- J. Installation Tolerance: Framing members shall be within the following limits:
 1. Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing a total variation of 1/4 inch in 8 feet from a true plane.
 2. Layout of Walls and Partitions: 1/4 inch from intended position
 3. Plates and Runners: 1/4 inch in 10 feet from a straight line.
 4. Studs: 1/4 inch in 10 feet out of plumb, not cumulative
 5. Headers and Sills of Openings: 1/8 inch from level across width of opening.
 6. Soffits: 1/4 inch in 10 feet from level straight line.
 7. Spacing of Framing Members: Comply with requirements of ASTM C 754.

3.5 INSTALLATION OF ACOUSTICAL INSULATION

- A. Install acoustical insulation at locations indicated before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement. Install insulation in voids as framing is installed that would be inaccessible after completion of framing.

- B. Install a single layer of insulation of required thickness to fill the full depth of cavity, unless otherwise indicated. Where cavity requires insulation that is thicker than standard size, install next larger size and compress into cavity.

1. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
- C. Hold batt insulation in place with insulation support anchors located at 5 feet on center full height of wall, starting at the top of each stud space.

3.6 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840 and GA-216, except as specified otherwise.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back -blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Attachment to Steel Framing: Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- F. Attach gypsum panels to framing provided at openings and cutouts.
- G. Form control and expansion joints with space between edges of adjoining gypsum panels.
 1. Where control joints are not shown, provide control joints at a maximum spacing of 30 feet; review proposed locations with Architect prior to commencement of work.
- H. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.) except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes and conduits
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by joists, and other structural members; allow 1/4 to 3/8 inch-wide joints to install sealant.
 4. Run gypsum panels to within 1/4 inch of floor slabs to provide full support of resilient wall base.
- I. Isolate perimeter of non-load bearing gypsum board partitions at structural abutments, except floors. Provide 1/4 to 1/2 inch wide spaces at these locations, and trim edges with casing bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
 1. Use fire-rated acoustical sealant for fire-rated walls.

- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
 - 1. Install continuous bead of acoustical sealant at base of walls sealing between edge of gypsum panels and floor slab. Install continuous bead of acoustical sealant, paintable type where exposed, at top of exterior wall sealing between edge of gypsum panel casing bead and underside of floor slab or roof deck. Tool material smooth and uniform to insure good contact and adhesion to substrate.
- K. Install continuous bead of acoustical sealant at base of all exterior walls sealing between edge of gypsum panels and floor slab. Install continuous bead of paintable acoustical sealant at top of all exterior walls sealing between edge of gypsum panel casing bead and underside of floor slab or roof deck. Tool material smooth and uniform to insure good contact and adhesion to substrate.

3.7 APPLYING TILE BACKING PANELS

- A. Tile Cementitious Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated. Install with 1/4 inch gap where panels abut other construction or penetrations.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plan across panel surfaces.
- C. Treat cut edges and holes in tile backer board with sealant.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: 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.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners
 - 2. LC-Bead: Use where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate
 - 3. L-Bead: Use where edge trim can only be installed after gypsum panels are installed.
 - 4. U-bead: Use where indicated
 - 5. Curved-Edge Cornerbead: Use at curved openings.

3.9 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, flanges of corner bead, edge trim, control joints, penetrations, fastener heads, surface defects and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, beveled edges, and damaged surface areas using setting-type joint compound.
- C. Apply joint tape over gypsum boards joints, except those with trim having flanges not intended for tape. Feather coats onto adjoining surfaces so camber is maximum 1/32 inch.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - 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 other Division 9 Sections.
- E. Glass-mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions for areas to receive FRP. Preparation for board to receive tile specified in Division 9.
- F. Cementitious Back Units: Finish according to manufacturer's written instructions.

3.10 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.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Quarry tile
2. Glazed Ceramic wall tile.
3. Metal edge strips installed as part of tile installation
4. Tile and grout sealer

B. Related Sections include the following:

1. Division 3 Section "Concrete Slabs on Grade and Structural Concrete Slabs" for monolithic slab finishes specified for tile substrates.
2. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
3. Division 9 Section "Gypsum Board Assemblies" for tile backer board.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include installation instructions, indicate application requirements, cure time before grouting.

B. Provide samples of all tiles and accessories for approval

1.3 DELIVERY, STORAGE AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

1. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

C. Store adhesives in unopened containers and protected from freezing.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient and substrate temperatures and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1. Maintain temperatures at 50 deg F or more in tiled areas during installation and for 7 days after completion, unless high temperatures are required by referenced installation standard or manufacturer's instructions.
- B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

1.5 COORDINATION

- A. Trades Coordination: Coordinate project schedule to complete work by other trades and vacate areas receiving floor coverings, stopping pedestrian traffic over newly installed flooring installation until curing and drying period for setting bed and grout is complete.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

- A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. Unglazed Quarry Tile: Square-edged flat tile as follows:
 1. Wearing Surface: Non-abrasive and abrasive as noted.
 2. Facial Dimensions: 6 by 6 inches.
 3. Thickness: 1/2 inch.
 4. Face: Pattern of design indicated.
 5. Provide 5 x 6 quarry tile cove base, cove base incorners and outcorners to match flooring
 6. Products: American Olean Stone Gray – Quarry Natural No. 6
- C. Glazed Ceramic Wall Tile: Flat tile as follows:
 1. Module Size: 6 by 6 inches, unless indicated otherwise.
 2. Thickness: 5/16 inch.
 3. Face: Pattern of design indicated, with manufacturer's standard edges.
 4. Products: Crossville A105 (WT14) Yellow Brick Road, Crossville A107 (WT35) Mud Pie
- D. Glass Wall Tile
 1. Module Size: 6 by 6 inches, unless indicated otherwise
 2. Thickness: 1/4"
 3. Products: Diamond Tech Glass Tile – T471 - Blue

2.2 SETTING AND GROUTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials for Quarry Tile: ANSI A108.1A and as specified below:

1. Portland Cement: ASTM C-150, Type I or II.
 2. Hydrated Lime: ASTM C-206 or C-207, Type S.
 3. Sand: ASTM C-144, clean, washed, sharp, durable, uncoated aggregate free from all deleterious substances, uniformly graded from coarse to fine with 100% passing through a No. 4 mesh screen, and not more than 5% passing through a No. 100 mesh screen.
 4. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
 5. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches by 0.062-inch diameter (16 gage) minimum; comply with ASTM A 185 and ASTM A 82 except for minimum wire size.
 6. Bond Coat: Latex-portland cement mortar.
- B. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
1. Prepackaged dry-mortar mix containing dry polymer additive to which only water must be added.
- C. For wall applications, provide nonsagging mortar.
- D. Organic Adhesive: ANSI A136.1, Type I, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Polymer-Modified Sanded Tile Grout: ANSI A118.7.
1. Product: Bostic Hydroment Ceramic Tile Grout (sanded) mixed with 425 Multi-Purpose Acrylic Latex Additive.
 2. Product: Laticrete SpectraLock Pro Premium Grout
 3. Proma ProGrout - sanded

2.3 MISCELLANEOUS MATERIALS

- A. Elastomeric Sealants: Elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 07 Section "Joint Sealants."
1. One-Part, Mildew-Resistant Silicone: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for in-service exposures of high humidity and extreme temperatures.
 - a. Color:
 - 1) White for wall tile receiving white grout.
 - 2) Translucent for all other locations.
 - b. Products:
 - 1) Dow Corning Corporation; Dow Corning 786.
 - 2) GE Silicones; Sanitary 1700.
 - 3) Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
 - 4) Tremco, Inc.; Tremsil 200.

- B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials.
- C. Metal Edge Strips: Angle or L-shape, half-hard brass exposed-edge material, single-spacer design, height to match finish tile height.
 - 1. Product: Schluter SCHIENE-M.
- D. Control Joints (CJ): Control joints for floor tile, brass side anchoring legs with soft synthetic rubber spacer, height to match finish tile height.
 - 1. Product: Schluter DILEX-MKSN.
- E. Outside Corner Wall Trim: Rounded outside corner profile, integral joint spacer, height to match finish tile height.
 - 1. Product: Schluter RONDEC-RO
- F. Tile Backing Panel Joint Tape: 2 inch wide, high strength, alkali-resistant glass mesh tape.
- G. Penetrating Tile and Grout Sealer: Water-based repellent product for sealing tile and grout joints that does not change color or appearance of treated surface.
 - 1. Products:
 - a. Aqua Mix, Inc., Sealer's Choice Gold.
 - b. Miracle Sealants Co., 511 H2O.
- H. Grout Sealer: Water-based repellent product for sealing grout joints that does not change color or appearance of treated surface.
 - 1. Products:
 - a. Aqua Mix, Inc., Ultra-Seal Aqua Mix Grout Sealer.
 - b. Aqua Mix, Inc., Grout Sealer.

2.4 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions, including those for accurate proportioning of materials, water, or additive content; type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce mortars and grouts of uniform quality with optimum performance characteristics for application indicated.
- B. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

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 installed tile.
- B. Water test pitched slabs to drain at thin-set locations. High spots shall be ground and low areas filled to provide proper slope to drains without ponding of water.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Commencement of installation shall indicate Installer has accepted condition of existing substrate.

3.2 PREPARATION

- A. Protect surrounding work from damage or disfiguration.
- B. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- C. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions.
- D. Remove protrusions, bumps, and ridges by sanding or grinding.
- E. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- F. Vacuum clean existing substrate and damp clean.
- G. Fill joints in tile backer panels, embed joint tape into thin set mortar and level surface.

3.3 INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Lay tile in patterns indicated. When field conditions conflict with indicated pattern, notify Architect in writing prior to installation for review and approval of revisions.

- D. 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.
- E. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Grind cut edges of tile abutting trim, finish, or built-in items. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile. Top setting of coved base is not permitted.
- F. Tile shall lay flat and each edge flush with adjacent tile, free of tilting and skewed tile. Provide additional setting material to shim accent tiles that are thinner than field tiles so face is in same plane.
- G. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
- H. Sound floor tile after setting. Replace hollow sounding units.
- I. Form wall tile internal intersections square. Provide aluminum corner trim at all outside corners. Provide trim one-piece full height of corner. Where wall height exceeds available manufactured trim lengths, locate splice at top of trim.
- J. Lay out tile wainscots to next full tile beyond dimensions indicated.
- K. Expansion Joints: Locate expansion joints and other sealant-filled joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- L. Grout tile to comply with requirements of ANSI A108.10, unless otherwise indicated.
- M. Install tile on floors with the following joint widths unless indicated otherwise:
 - 1. Ceramic Mosaic Tile: 1/16 inch.
 - 2. Quarry Tile: 1/4 inch.
 - 3. Porcelain Tile: 3/16 inch.
- N. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets other flooring that finishes flush with top of tile.
- O. Align floor tile and base grout joints.
- P. Install tile on walls with the following joint widths:
 - 1. Ceramic Mosaic Tile: 1/16 inch.
 - 2. Glazed Wall Tile: 1/16 inch.
 - 3. Porcelain Wall Tile: 3/16"

Q. Tile and Grout Sealer:

1. Thoroughly clean tile surfaces, removing all grout residue and haze.
2. Allow grout to cure 72 hours before application of sealer.
3. Apply penetrating tile and grout sealer to quarry tile floors, and to the grout joints in glazed wall tile and mosaic floor and wall tile according to sealer manufacturer's written instructions. Apply evenly, avoiding puddling. Allow sealer to set on surface approximately 3 minutes, then remove excess sealer residue from tile faces by wiping with soft cloth.
4. Apply grout sealer to grout joints in glazed wall tile and mosaic floor and wall tile according to sealer manufacturer's written instructions. Remove excess sealer from tile faces before it dries by wiping with soft cloth.
5. Allow sealers to cure 24 hours before getting wet.

R. Apply elastomeric sealant to junction of tile and dissimilar materials.

3.4 PROTECTION

- A. Cover completed floors with durable protective sheet material. To the maximum extent possible, prohibit traffic over finished floor surface. Motorized man lifts and vehicles shall not be allowed on tiled floors.

3.5 FLOOR TILE INSTALLATION SCHEDULE

- A. Interior floor installation on concrete; reinforced cement mortar bed (thickset) with cleavage membrane; TCA F111.
1. Bond Coat/Thin-Set Mortar: Latex- portland cement mortar.
 2. Grout: Polymer-modified sanded grout. Allow installation to cure not less than 48 hours before grouting.
- B. Interior floor installation on concrete; thin-set mortar; TCA F113.
1. Thin-Set Mortar: Latex- portland cement mortar.
 2. Grout: Polymer-modified sanded grout. Allow installation to cure and be completely dry, but not less than 12 hours before grouting.

3.6 WALL TILE INSTALLATION SCHEDULE

- A. Interior wall installation over gypsum board on metal studs (Toilet Rooms Only); organic adhesive; TCA W242.
1. Grout: Polymer-modified unsanded grout. Allow installation to cure and be completely dry, but not less than 24 hours before grouting.
- B. Interior wall installation; thin-set mortar; over gypsum board; TCA W243 and cementitious backer units; TCA W244.

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1. Thin-Set Mortar: Latex- portland cement mortar.
2. Grout: Polymer-modified unsanded grout. Allow installation to cure and be completely dry, but not less than 24 hours before grouting.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exposed suspension systems
2. Acoustical panels
3. Acoustical insulation over acoustical panels.

B. Related Sections include the following:

1. Division 01, Section 018115 Sustainable Design Requirements Summary"
2. Division 22, 23, 26 and 28 Sections for coordination of air handling devices, fire protection devices and electrical devices installed in ceiling systems.

1.2 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory or an NVLAP-accredited laboratory.

B. Fire-Test-Response Characteristics:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Identify materials with appropriate markings of applicable testing and inspecting agency.
2. Surface-Burning Characteristics: Acoustical panels complying with ASTM E 1264 for Class A materials, when tested per ASTM E 84.

1.3 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, dust generating activities are completed, wet work in spaces is complete and dry, and work above ceilings is complete, tested and approved. Maintain ambient temperature at minimum 60 deg F and humidity at 20 to 40 percent prior to, during, and after installation.

1.4 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system and partition assemblies.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANEL CEILINGS, GENERAL

- A. Acoustical Panel Standard: Comply with ASTM E 1264.
- B. Metal Suspension System Standard: Comply with ASTM C 635.
 - 1. Framing Members: Shall have a maximum deflection of 1/360
 - 2. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
- D. Wire Hangers, Braces, and Ties: Zinc-coated carbon-steel wire; ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 1. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch diameter wire.
- E. Accessories: Stabilizer bars, clips splices, and hold down clips as required.
- F. Seismic perimeter stabilizer bars, seismic struts, and seismic clips.
- G. Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Products: Armstrong Fine Fissured
- B. Fissured Acoustic Panels: Provide panels complying with ASTM E 1264 for type and form as follows:
 - 1. Type and Form: Type III, mineral base with painted finish
 - 2. Size: 24 by 48 inches

3. Thickness: 5/8 inch
4. NRC: 0.55
5. CAC: 35
6. Edge Detail: Square
7. Humidity sag resistant
8. Anti-microbial protection

C. Fine Fissured Ceramaguard Unperforated.#605 Provide panels complying with ASTM E 84 for type and form as follows:

1. Type and Form: Type IV, Form 2, fire Class A
2. Size: 24 by 48 inches
3. Thickness: 3/4 inch
4. CAC: 70
5. Edge Detail: Square
6. Humidity sag resistant
7. Anti-microbial protection
8. Scrutable

2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING S

A. Products: Provide one of the following:

1. Armstrong World Industries, Inc.; Prelude Exposed Tee System, 7300 Series.
2. Chicago Metallic Corporation; 1200 System
3. USG Interiors, Inc.; DX System

2.4 ACOUSTIC BATT INSULATION

A. Acoustic Batt Insulation, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers, with maximum flame-spread and smoke developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics

1. Thickness: 3 inches

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing in which acoustical panel ceilings attach or abut and confirm conditions are ready to receive work of this Section.
- B. Verify that layout of hangers will not interfere with work of other Sections
- C. Commencement of work shall confirm acceptance of existing conditions.

3.2 INSTALLATION

- A. Comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders.
- C. Suspend ceiling hangers from building's structural members, plumb and free from contact with insulation or other objects within ceiling plenum. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers, use trapezes or equivalent devices. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires. Framing system shall be capable of supporting imposed loads to a maximum deflection of 1/360.
 - 1. Do not support ceilings directly from permanent metal forms or floor deck; anchor into concrete slabs.
 - 2. Do not attach hangers to steel deck tabs or to steel roof deck.
 - 3. Coordinate location of hangers with work of other Sections
 - 4. Hang system from structure, independent of walls, columns, ducts, pipes and conduit.
 - 5. Do not eccentrically load system or produce rotation of runners.
- D. Suspension system shall be reinforced to support diffusers, light fixtures and any additional members. Install hanger wires to grid at each corner of light fixtures. Coordinate location with electrical and other trades.
 - 1. Each individual fixture and attachment with combined weight of 56 lbs. Or less shall have two 12-gage wire hangers attached at diagonal corners of the fixture; wires shall be slack. Fixtures and attachments with a combined weight of greater than 56 lbs. Shall be independently supported from the structure at all four corners. Hangers shall be located within 6 inches of each corner.
- E. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Use longest practical lengths. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
- F. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- G. Install panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
- H. Lay acoustic batt insulation for distance of 48 inches either side of acoustic partitions that are not run to underside of structure and sealed.
- I. Install hold-down clips to retain panels tight to suspension system within 20 feet of exterior doors.

3.3 TOLERANCES

- A. Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Variation from Plumb of Suspension Members Caused by Eccentric Loads: Two degrees maximum.

END OF SECTION 095113

SECTION 096500 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base and accessories
 - 2. VCT Installation Instructions

1.2 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.3 PROJECT CONDITIONS

- A. Move resilient flooring materials and adhesives into installation area three days prior to installation to achieve temperature stability.
- B. Maintain ambient and substrate temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient flooring.
- C. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- D. Close spaces to traffic during floor tile installation and for 48 hours after resilient flooring installation.
- E. Install resilient flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RESILIENT WALL BASE AND MOLDING ACCESSORIES

- A. Resilient Base: ASTM F 1861.
 - 1. Manufacturers:
 - a. Armstrong World Industries, Inc.
 - b. Johnsonite.
 - 2. Material Requirement: Type TV (vinyl, thermoplastic).
 - 3. Manufacturing Method: Group I (solid, homogeneous).
 - 4. Style: Cove (base with toe).

5. Minimum Thickness: 0.125 inch.
6. Height: 4 inches and 6 inches as indicated on Drawings.
7. Lengths: Coils in manufacturer's standard length.
8. Outside Corners and Exposed Ends: Preformed.
9. Finish: Satin.

B. Resilient Molding Accessories:

1. Manufacturers:
 - a. Armstrong World Industries, Inc.
 - b. Johnsonite.
2. Material: Vinyl.
3. Transition Strips: The following product identification numbers are for products manufactured by Johnsonite. Provide listed products or equal from one of listed manufacturers.
 - a. Carpet to Resilient: No. CTA-XX-D.
 - b. Resilient to Epoxy or Concrete: No. RRS-XX-D.
 - c. Carpet to Concrete: No. EG-XX-G.
4. Colors and Patterns: As indicated by manufacturer's designations; if not indicated, as selected by Architect from full range of manufacturer's colors.

2.2 INSTALLATION MATERIALS

- A. Concrete Slab Primer: Nonstaining type as recommended by flooring manufacturer.
 1. Product: Ardex; P-51 Primer or P-82 Ultra Primer; as recommended by manufacturer for applications indicated.
- B. Underlayment Floor Leveling System: Portland cement based self-leveling system with inorganic binder content; having a compressive strength of 4100 psi after 28 days; and capable of being feathered to match existing elevations.
 1. Product: Ardex; K-15.
- C. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
 1. Product: Ardex; SD-F Feather Finish.
- D. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated. Provide adhesive with a VOC limit of 50 g/L
- E. Sealer: Provide protective sealer as recommended by manufacturer.
- F. Detergent Solution: Neutral detergent solution wash applied immediately after installation

- G. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
 - 1. Maximum variation of 1/8 inch in 10 feet, nonaccumulative.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Commencement of work shall mean acceptance of substrate and site conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, silicone, gypsum joint compounds, and existing non-secure leveling materials using mechanical methods recommended by manufacturer. Do not use solvents.
 - a. Installer is responsible for the proper subfloor preparation for a solid bond.
 - 3. Bond and Moisture Testing: Verify floors are sufficiently dry for install of floor tile by performing Armstrong's bond and moisture test. Using specified flooring material, install 3 foot square panels approximately 50 feet apart throughout the installation area using specified adhesive. If the panels are securely bonded after a 72 hour period, the subfloor is considered acceptable.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. Do not use any paraffin or oil based sweeping compounds.

- F. When flooring adhesives are received, check package labels for product age; product has a 1-year shelf life. Discard materials that have exceeded their shelf life.

3.3 UNDERLAYMENT INSTALLATION

- A. Preparation: Mechanically clean floor by shot-blasting, scarifying or other means that leaves no residue. Do not use chemical means or acid etching; the use of solvents is not an acceptable means of cleaning the substrate. Vacuum clean substrates to be covered by underlayment immediately before application of primer. Installer is responsible for the proper subfloor preparation for a solid bond.
 - 1. Cracks in the subfloor shall be repaired to minimize telegraphing through underlayment
- B. Priming: Install in accordance with manufacturer's instructions. Use Ardex P-51 Primer for standard absorbent concrete. Use Ardex P-82 Ultra Primer over non-porous subfloors, cutback and other adhesive residues.
- C. Underlayment: Mix and apply in accordance with manufacturer's instructions. Installer shall use mixing equipment and tools approved by the manufacturer.
 - 1. Apply underlayment to a minimum thickness of 1/8-inch over highest point the subfloor with an average thickness of 1/4-inch.
- D. Protect underlayment from abuse by other trades by the use of plywood, masonite, or other suitable protection course until installation of finish floor.

3.4 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles in indicated pattern.. VCT should be laid out in a Basketweave configuration
- C. Mix tile from container to ensure shade variations are consistent.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Hand roll with a heavy roller to attain full adhesion.

3.5 RESILIENT BASE AND MOLDING ACCESSORIES INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable, but not less than 18 inches, without gaps at seams and with tops of adjacent pieces aligned.
 - 1. Miter internal corners. Use pre-molded units at external corners and exposed ends.
 - 2. Install base on solid backing.
 - 3. Scribe and fit to door frames and other interruptions.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient flooring.
- B. Remove excess adhesive from floor, base, and wall surfaces without damage.
- C. Damp mop floor with a neutral detergent solution (Armstrong S-485 Commercial Floor Cleaner) at 3- 4 ounces per gallon, while carefully scrubbing black marks and excessive soil. Do not we wash, scrub or strip the floor for at least four to five days after installation.
- D. Apply two coats of a high quality commercial floor polish (Armstrong S-480 Commercial Floor Polish) The use of a high quality stain-resistant sealer (Armstrong S-495 Commercial Floor Sealer) beneath the polish should be installed in areas of high traffic.

END OF SECTION 096519

SECTION 099123 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Steel.
 - 3. Galvanized metal.
 - 4. Aluminum (not anodized or otherwise coated).
 - 5. Wood.
 - 6. Gypsum board.

1.2 RELATED SECTIONS

- A. See Division One, Section 08115 Sustainable Design Requirements

1.3 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 - 2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
 - 3. Final approval of color selections will be based on benchmark samples.
 - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.4 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 3 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are 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, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Refer to Section 018115 for list of VOC Requirements.
- C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - 1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 - 2. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.

- q. Lead.
- r. Mercury.
- s. Methyl ethyl ketone.
- t. Methyl isobutyl ketone.
- u. Methylene chloride.
- v. Naphthalene.
- w. Toluene (methylbenzene).
- x. 1,1,1-trichloroethane.
- y. Vinyl chloride.

- D. Colors: As indicated in Interior Finish schedule.

2.2 BLOCK FILLERS

- A. Interior/Exterior Latex Block Filler: MPI #4.

2.3 PRIMERS/SEALERS

- A. Interior Latex Primer/Sealer: MPI #50.
- B. Interior Alkyd Primer/Sealer: MPI #45.
- C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.4 METAL PRIMERS

- A. Alkyd Anticorrosive Metal Primer: MPI #79.
- B. Quick-Drying Alkyd Metal Primer: MPI #76.
- C. Rust-Inhibitive Primer (Water Based): MPI #107.
- D. Cementitious Galvanized-Metal Primer: MPI #26.
- E. Waterborne Galvanized-Metal Primer: MPI #134.
- F. Vinyl Wash Primer: MPI #80.
- G. Quick-Drying Primer for Aluminum: MPI #95.

2.5 WOOD PRIMERS

- A. Interior Latex-Based Wood Primer: MPI #39.

2.6 LATEX PAINTS

- A. Interior Latex (Flat): MPI #53 (Gloss Level 1).
- B. Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).
- C. Interior Latex (Eggshell): MPI #52 (Gloss Level 3).
- D. Interior Latex (Satin): MPI #43 (Gloss Level 4).
- E. Interior Latex (Semigloss): MPI #54 (Gloss Level 5).
- F. Interior Latex (Gloss): MPI #114 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
- G. Institutional Low-Odor/VOC Latex (Flat): MPI #143 (Gloss Level 1).
- H. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).
- I. Institutional Low-Odor/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).
- J. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).
- K. High-Performance Architectural Latex (Low Sheen): MPI #138 (Gloss Level 2).
- L. High-Performance Architectural Latex (Eggshell): MPI #139 (Gloss Level 3).
- M. High-Performance Architectural Latex (Satin): MPI #140 (Gloss Level 4).
- N. High-Performance Architectural Latex (Semigloss): MPI #141 (Gloss Level 5).
- O. Exterior Latex (Flat): MPI #10 (Gloss Level 1).
- P. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).
- Q. Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).

2.7 ALKYD PAINTS

- A. Interior Alkyd (Flat): MPI #49 (Gloss Level 1).
- B. Interior Alkyd (Eggshell): MPI #51 (Gloss Level 3).
- C. Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).
- D. Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).

2.8 QUICK-DRYING ENAMELS

- A. Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).

- B. Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).

2.9 TEXTURED COATING

- A. Latex Stucco and Masonry Textured Coating: MPI #42.

2.10 DRY FOG/FALL COATINGS

- A. Latex Dry Fog/Fall: MPI #118.
- B. Waterborne Dry Fall: MPI #133.
- C. Interior Alkyd Dry Fog/Fall: MPI #55.

2.11 ALUMINUM PAINT

- A. Aluminum Paint: MPI #1.

2.12 FLOOR COATINGS

- A. Interior Concrete Floor Stain: MPI #58.
- B. Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.
- C. Interior/Exterior Clear Concrete Floor Sealer (Solvent Based): MPI #104.
- D. Interior/Exterior Latex Floor and Porch Paint (Low Gloss): MPI #60 (maximum Gloss Level 3).
- E. Exterior/Interior Alkyd Floor Enamel (Gloss): MPI #27 (Gloss Level 6).
 - 1. Additives: Manufacturer's standard additive to increase skid resistance of painted surface.

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 work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.

3. Wood: 15 percent.
 4. Gypsum Board: 12 percent.
 5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION AND APPLICATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- C. 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.
- D. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
1. Mechanical Work:
 - a. Uninsulated metal piping.
 - b. Uninsulated plastic piping.
 - c. Pipe hangers and supports.
 - d. Tanks that do not have factory-applied final finishes.
 - e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
 2. Electrical Work:
 - a. Switchgear.
 - b. Panelboards.
 - c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

- E. 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.
- F. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.3 INTERIOR PAINTING SCHEDULE

- A. See Sheet A206 for specific paint manufacturers and colors
- B. Concrete Substrates, Nontraffic Surfaces:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 3.1M.
 - a. Prime Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex eggshell.
- C. CMU Substrates:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 4.2E.
 - a. Prime Coat: Interior/exterior latex block filler.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex eggshell.
- D. Steel Substrates:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.1S.
 - a. Prime Coat: Rust-inhibitive primer (water based).
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex semigloss.
- E. Galvanized-Metal Substrates:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.3N.
 - a. Prime Coat: Waterborne galvanized-metal primer.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex semigloss.
- F. Aluminum (Not Anodized or Otherwise Coated) Substrates:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 5.4G.
 - a. Prime Coat: Quick-drying primer for aluminum.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex eggshell.

- G. Wood Panel Substrates: Including painted plywood, medium-density fiberboard.
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 6.4T.
 - a. Prime Coat: Interior latex-based wood primer.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex (eggshell).

- H. Gypsum Board Substrates:
 - 1. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.
 - a. Prime Coat: Interior latex primer/sealer.
 - b. Intermediate Coat: Institutional low-odor/VOC interior latex matching topcoat.
 - c. Topcoat: Institutional low-odor/VOC interior latex (flat).

- I. Steel Substrates - Overhead Areas
 - 1. Institutional Low Odor/VOC Waterbone Acrylic Dry Fall
 - 2. Topcoat: flat

- J. Steel Substrates - Below Grade
 - 1. Low VOC Coal Tar Mastic - Manufactured by Northtown Company, Product HT50

END OF SECTION 099123

SECTION 102600 - WALL PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall guards.
2. Bumper Rails
3. Corner guards.

B. See Division 8 Section "Door Hardware" for kick, mop and push plates

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's installation instructions.

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B. Maintenance data.

1.3 QUALITY ASSURANCE

A. Fire-Test Response Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

1.5 COORDINATION

A. Coordinate installation of concealed blocking and anchor devices that are specified in other Sections to support work of this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products specified.
 - 1. Pawling Corporation, Wassaic, NY; website: www.pawling.com phone: 800-431-3456

2.2 MATERIALS

- A. Extended Rigid Plastic: high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout.
- B. Aluminum Extrusions: ASTM B 221
- C. Stainless Steel Sheet: ASTM A 240/A 240M
- D. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal. Use security-type fasteners where exposed to view.
- E. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 WALL GUARDS

- A. Wall Guards (Crash Rail): WG2 - Heavy-duty assembly consisting of continuous snap-on plastic cover installed over concealed retainer with continuous rubber or vinyl bumper cushion(s) centered in the retainer, designed to withstand impacts.
 - 1. Product:
 - a. Pawling Corporation. Pro-Tek
 - 2. Cover: Extruded rigid plastic, minimum 0.100-inch wall thickness, as follows:
 - a. Profile: Flat profile, nominal 8 inches high by 1 inch deep
 - 3. Retainer: Minimum 0.080-inch- thick, one-piece, extruded aluminum.
 - a. Mounting: Surface mounted directly to wall
 - 4. End Caps and Corners: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
 - 5. Accessories: Concealed splices and mounting hardware.
- B. Wall Bumper: WG4 - Assembly consisting of continuous snap-on plastic cover installed over concealed, continuous retainer; designed to spring back when hit.
 - 1. Product: Subject to compliance with requirements, provide Pawling Corp.'s Pro-Tek Series wall bumper
 - 2. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness as follows:

- a. Profile: Flat profile, nominal 3 inches high by 1 inch deep
3. Retainer: Minimum 0.0625-inch- thick, one-piece, extruded aluminum.
4. Bumper: Continuous rubber or vinyl bumper cushion(s).
5. End Caps and Corners: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
6. Accessories: Concealed splices and mounting hardware.
7. Mounting: Surface mounted directly to wall.

2.4 CORNER GUARDS

- A. Surface-Mounted, Clear Plastic Corner Guards: Fabricated from clear polycarbonate sheet; with formed edges, fabricated with 90 degree turn.
 1. Product::
 - a. Pawling Corporation. Pro-Tek CG-25
 2. Wing Size: Nominal 3" x 3"
 3. Mounting: Countersunk screws through factory-drilled mounting holes.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performances of work.

3.2 INSTALLATION

- A. Install corner guards 4 inches above finish floor to 48 inches high. Provide corner guards at all outside corners in the sales area, and at locations indicated.
 1. Maximum Variation from Required Height: 1/4 inch
 2. Maximum Variation from Level for Visible Length: 1/8 inch
- B. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent recommended by the wall protection manufacturer.
- C. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600

SECTION 210500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Escutcheons.
 - 3. Supports and anchorages.
 - 4. Provide minor piping relocations and head relocations/additions as required for new floor plan layout shown on architectural drawings.

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, and unexcavated spaces.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 QUALITY ASSURANCE

- A. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 21 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 21 piping Sections for special joining materials not listed below.

2.3 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 21 Sections specifying piping systems..
- B. Install piping in concealed locations for rooms or areas with suspended ceilings, unless otherwise indicated and except in spaces with exposed structure ceilings, equipment rooms and service areas. Conceal pipe drops or risers in walls and partitions to greatest extent possible.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise. Install sprinkler piping in exposed areas as high as possible. Piping in exposed structure ceilings shall be run above the bottom chord of open web joists.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Slope piping to low points and provide drain valves. All parts of the piping system shall be drainable.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Install escutcheons for penetrations of walls, ceilings, and floors.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 21 Sections specifying piping systems.
- B. Ream ends of pipes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

END OF SECTION 210500

SECTION 220400 - PLUMBING SUMMARY OF WORK

PART 1 – GENERAL

1.1 SUMMARY

- A. Summary: Briefly and without force and effect on contract documents, plumbing work can be generally summarized as (but is not necessarily limited to) the following to the work described in this Section and other Division 22 Sections.
- B. General Work: General work associated with plumbing systems and equipment, and to be performed as plumbing work, includes piping, materials, pipe sleeves, pipe supports, anchors, meters, gages, electrical disconnects, motor starters, vibration isolation, sound isolation, drip pans, access panels, identification, coordination drawings, record drawings, installation permits, tests, inspection, cutting-and-patching work, start-up of systems, training of Owner's operating personnel, operating and maintenance manuals, operating permits, final cleaning of plumbing work, continued operation of certain equipment for specified periods after Owner's acceptance or occupancy, and similar work. All work must be in conformance with all state and local codes.

1.2 PLUMBING

- A. Perform work as indicated on Plans and in the Specifications, and in conformance to all applicable codes. Any waste materials must be removed and disposed of legally. Furnish and install components to make a fully functional system.
- B. Modify the Domestic water system. Make any additions including pipe, valves, backflow preventers, pressure gauges; and pressure reducing valve when necessary.
- C. Provide the sanitary drainage system constructed of NSF approved materials, including both direct and indirect waste systems. Sump pits and grease traps are included where necessary. Building traps are to be included where they are required.
- D. Condensate piping for air conditioners, coolers, and freezers. Including insulation and electrical tracing.
- E. A gas piping system serving space heating, cooking appliances, and emergency power systems. Include pressure regulators, shut-off valves and flexible appliance connectors. Coordinate installation with the HVAC Contractor and Electrical Contractor. The Gas piping is to be tested at 50 times working pressure, and be leak tight for a period of 1 hour. Written certification to be given to Owner's Construction Project Manager.

1.3 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.

1.4 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be installed.

1.5 OWNER FURNISHED EQUIPMENT

- A. Rough-in, install and make final connections to Owner furnished plumbing fixtures and Owner furnished equipment.
- B. Verify final locations for rough-ins with field measurements and with the requirements of the actual fixtures and equipment to be installed.

1.6 COORDINATION

- A. The Contractor shall acquaint himself with space requirements of other trades and call to the Architect/Engineer's attention any conflicts noted prior to performing any work. If work is started without notice to the Architect/Engineer, Contractor assumes responsibility for any work that has to be done over.
- B. Contractor shall have materials on the job and erected in conformance with building work schedule and in full coordination with other trades. Coordination with the electrical contractor to assure proper power supply to each component is the responsibility of the plumbing contractor. Provide plumbing to mechanical equipment in requiring water or drainage.
- C. Coordinate installation of plumbing equipment and materials with all other building components.
- D. Verify all dimensions by field measurements.
- E. Arrange for chases, slots, and openings in other building components to allow for plumbing installations.
- F. Coordinate the cutting and patching of building components to accommodate the installation of plumbing equipment and materials.
- G. Where mounting heights are not detailed or dimensioned, install plumbing services and overhead equipment to provide the maximum headroom possible consistent with being serviceable. In spaces above accessible ceilings mount equipment no lower than 12 inches, to the bottom of the equipment or piping, above the ceiling and no higher than 24 inches to the bottom of equipment or piping, above the ceiling
- H. Install plumbing equipment to facilitate maintenance and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.
- I. Coordinate the installation of plumbing materials and equipment above ceiling with suspension system, light fixtures, and other installations.
- J. Coordinate connections of plumbing systems with exterior underground and overhead utilities and services. Provide required connection for each service.

1.7 CONTRACT DRAWINGS

- A. Contract drawings are in part diagrammatic, intended to convey the scope of work and indicated general arrangements of equipment, piping, and approximate sizes and locations of equipment and outlets. Contractor shall familiarize himself with all conditions affecting his work and shall verify spaces in which his work will be installed.
- B. Where job conditions require reasonable changes in indicated locations and arrangement, make such changes without extra cost to Owner.
- C. The Contractor shall carefully study and compare all contract drawings, specifications, and other instructions and shall at once report to the Architect/Engineer any error, inconsistency, deviation from actual conditions, or omission which he may discover.

1.8 CUTTING AND PATCHING

- A. Perform cutting, fitting, and patching of plumbing equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed Work;
 - 2. Remove and replace defective Work;
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents;
 - 4. Install equipment and materials in existing structures;
 - 5. Upon written instructions from the Architect/Engineer, uncover and restore work to provide for Architect/Engineer observation of concealed Work.
- B. Do not endanger or damage installed Work through procedures and processes of cutting and patching.
- C. Arrange for repairs required to restore other Work, because of damage caused as a result of plumbing installations.
- D. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.
- E. Cut, remove and legally dispose of any indicated plumbing equipment, components, and materials as required.
- F. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

1.9 SEQUENCING AND SCHEDULING

- A. Construct work in sequence under the provisions of Division 01 Sections.
- B. All concealed piping conveying greasy waste, sanitary waste, condensate, vent, rain water, domestic water or hydronic water shall be fully charged and leak-tested prior to completion of the wall or ceiling enclosures. The cost of repairing damages to other Work during charging and leak testing shall be the responsibility of the Plumbing Contractor. If permanent site water is not available at this time, temporary water shall be used to complete this testing.

- C. Concealed gas piping shall be leak-tested in accordance with NFPA 54, “The National Fuel Gas Code” prior to completion of the wall or ceiling enclosures. The cost of repairing damages to other Work during leak testing shall be the responsibility of the Plumbing Contractor.

1.10 NAMEPLATE DATA

- A. Provide a permanent nameplate on each item of power operated plumbing equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliance’s, and similar essential data. Locate nameplates in an accessible location.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for district identifications; adequately packaged and protected to prevent damage during shipment, storage and handling.
- B. Store and protect products in accordance with Division 01 Sections.

1.12 RECORD DOCUMENTS, (SD-P1C)

- A. Maintain record documents in accordance with requirements. Record documents shall be available for inspections and reference at any time during construction.
- B. Mark a set of drawings to indicate any revisions to piping, size and location both exterior and interior; including locations of control devices, filters, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned for column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, tanks, etc.); and Change Orders.

END OF SECTION 220400

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Sleeves.
 - 3. Escutcheons.
 - 4. Equipment installation requirements common to equipment sections.
 - 5. Supports and anchorages.
 - 6. Earthwork

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, and unexcavated spaces.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

- A. (SD-P2A) Product data for adhesives and sealants used inside the weatherproofing system, including printed documentation of VOC content. Low-emitting materials standards are listed in Section 018115, "Sustainable Design Requirements".

1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

- B. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- C. Solvent Cements for Joining Plastic Piping:
 - 1. CPVC Piping: ASTM F 493.
 - 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- D. PVC Pipe: ASTM D 1785, Schedule 40.

2.4 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavate and backfill for piping below slab. Over excavate by 6 inches in order to provide piping with sand bed. Compact bedding prior to laying pipe. Backfill may be excavated material which is suitable; otherwise provide granular backfill material passing a 2 inch sieve 100%. Compact backfill material in eight (8) inch lifts. Bring backfill up to sub-grade, compacted and ready for placing the floor slab. Backfill material and sand bedding shall be compacted to 95% modified density, meeting ASTM D1556 and ASTM D1557.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 22 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 1. Coordinate above slab and roof piping installation with other trades. Allow for the installation of refrigeration piping, sprinkler piping electrical conduits, controls conduits, communications system and fire alarm conduits, and hvac ductwork. Allow for the installation of architectural elements and décor items hung from the roof structure.
 2. Coordinate underslab piping installation with other trades Allow for the installation of underslab refrigeration piping, electrical conduits, controls conduits and structural foundations.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel and light fixture removal.
- F. Install piping to permit valve servicing. Install valves no higher than 18 inches above accessible ceilings, where accessible ceilings are indicated on the architectural drawings. Valves located above gypsum board ceilings shall be made accessible via access panels indicated on the plumbing drawings or shall be located above accessible ceilings, where access panels are not indicated.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.

- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- N. Verify final equipment locations for roughing-in.
- O. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- P. In addition to fixtures and equipment provided by the Contractor. Rough-in and make final connections for Owner furnished/Owner installed equipment and fixtures. Rough-in and make final connections for Owner furnished/Contractor installed equipment.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
 - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 5. PVC Nonpressure Piping: Join according to ASTM D 2855.
 - 6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible service clearance, including headroom for service personnel.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

END OF SECTION 220500

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermometers.

1.2 SUBMITTALS

- A. Product Data, SD-P4: For each type of product indicated.

PART 2 - PRODUCTS

2.1 METAL-CASE, LIQUID-IN-GLASS THERMOMETERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Terice, H. O. Co.
2. Weiss Instruments, Inc.
3. Marshalltown-Tempco

- B. Case: Die-cast aluminum, 9 inches long.

- C. Tube: Red or blue reading, organic-liquid filled, with magnifying lens.

- D. Tube Background: Satin-faced, nonreflective aluminum with permanently etched scale markings.

- E. Window: Glass.

- F. Connector: Adjustable type, 180 degrees in vertical plane, 360 degrees in horizontal plane, with locking device.

- G. Stem: Copper-plated steel, aluminum, or brass for thermowell installation and of length to suit installation.

- H. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

2.2 THERMOWELLS

- A. Manufacturers: Same as manufacturer of thermometer being used.

- B. Description: Pressure-tight, socket-type metal fitting made for insertion into piping and of type, diameter, and length required to hold thermometer.

PART 3 - EXECUTION

3.1 THERMOMETER APPLICATIONS

- A. Install liquid-in-glass thermometers in the cold water inlet to the water heater and outlet of, each, domestic hot water heater and, the hot-water storage tank.
- B. Install liquid-filled case-type, bimetallic-actuated dial thermometers at suction of each pump.
- C. Provide the following temperature ranges for thermometers:
 - 1. Domestic Cold Water and Tepid: 30 to 130 deg F, with 2-degree scale divisions.

3.2 INSTALLATIONS

- A. Install direct-mounting thermometers and adjust vertical and tilted positions.
- B. Install thermowells with socket extending 2 inches into the fluid, (where possible); as a minimum to center of pipe and in vertical position in piping tees where thermometers are indicated.
- C. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance for thermometers, gages, machines, and equipment.
- D. Adjust faces of thermometers and gages to proper angle for best visibility.

END OF SECTION 220519

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bronze ball valves.
2. Bronze swing check valves.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section “Facility Natural Gas Piping”

1.2 SUBMITTALS

- A. Product Data, SD-P5: For each type of valve indicated.

1.3 QUALITY ASSURANCE

- A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
- B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
1. Handlever: For quarter-turn valves NPS 6 and smaller.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. NIBCO INC.
2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

2.3 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Jenkins Valves.
 - b. NIBCO INC.
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.

- d. Body Material: ASTM B 62, bronze.
- e. Ends: Threaded.
- f. Disc: PTFE or TFE.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff and Throttling Service: ball valves.
 - 2. Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with nonmetallic disc.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Select valves, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Ball Valves: One piece, reduced port, bronze with bronze trim.
 - 3. Bronze Swing Check Valves: Class 125 nonmetallic disc.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Fastener systems.
 - 4. Equipment supports.
- B. See Division 22 Section "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

1.2 DEFINITIONS

- A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment.

1.4 SUBMITTALS

- A. Product Data, SD-P6: For the following:
 - 1. Steel pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Powder-actuated fastener systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
 1. Carpenter & Paterson, Inc.
 2. ERICO/Michigan Hanger Co.
 3. Grinnell Corp.
- C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig-minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
 1. Carpenter & Paterson, Inc.
 2. ERICO/Michigan Hanger Co.
 3. PHS Industries, Inc.
- C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Not permitted.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
 1. Manufacturers:
 - a. Hilti, Inc.

- b. ITW Ramset/Red Head.
- c. Powers Fasteners.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24, requiring clamp flexibility and up to 4 inches of insulation.
- E. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.
- F. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- G. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
 - 2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 4. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 - 5. C-Clamps (MSS Type 23): For structural shapes.

- H. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- I. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- C. Fastener System Installation:
 - 1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- D. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- G. Install lateral bracing with pipe hangers and supports to prevent swaying.
- H. Install building attachments to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping.
- I. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
- K. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION 220529

SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
 - a. Flexible elastomeric.
 - b. Mineral fiber.

1.2 SUBMITTALS

- A. Product Data, SD-P10: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials (pipe) and Type II for sheet materials (storage tanks).

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Armacell LLC; AP Armaflex.
 - b. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
 2. Thermal conductivity (k-value) at 75 deg F 24 deg C) is 0.27 Btu x in./h x sq. ft. x deg F (0.039 W/m x K) or less.
- F. Mineral-Fiber, Preformed Pipe Insulation:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Micro-Lok.
 - b. Knauf Insulation; 1000 Pipe Insulation.
 - c. Owens Corning; Fiberglas Pipe Insulation.
 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- G. Lavatory Guards: Provide TrueBro model Lav Guard 2 for exposed piping below accessible lavatories.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Keep insulation materials dry during application and finishing.
- F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- G. Install insulation with least number of joints practical.

- H. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- I. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- J. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- N. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations (where fire walls or partitions are indicated on the architectural drawings): Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Division 07 Section "Penetration Firestopping" firestopping and fire-resistive joint sealers.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 - 6. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 - 7. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions.

Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

8. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.5 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- B. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

- B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

3.8 FINISHES

- A. Equipment and Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system specified in Division 09 painting Sections.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. 3.12 PIPING INSULATION SCHEDULE, GENERAL
- D. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 1. Underground piping.
 2. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot, Recirculated Hot Water and Hydronic: Insulation shall be one of the following:
 1. Flexible Elastomeric: 3/4 inch thick.
 2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- B. Domestic Cold and Filtered Water (Potable): Insulation shall be one of the following:
 1. Flexible Elastomeric: 3/4 inch thick.
 2. Mineral-Fiber, Preformed Pipe Insulation, Type I: **1 inch** thick.
- C. Condensate Drain Piping Where Heat Tracing Is Installed (typical all freezers and the meat cooler): Insulation shall be the following:
 1. Flexible Elastomeric: 3/4 inch thick.
- D. Condensate Drain Piping Without Heat Tracing Installed (typical all coolers except meat cooler): Insulation shall be the following:
 1. Flexible Elastomeric: 1/2 inch thick.

END OF SECTION 220700

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Escutcheons.
4. Sleeves and sleeve seals.
5. Earthwork for below slab or underground water piping.

1.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to SEI/ASCE 7.

1.3 SUBMITTALS

- A. Product Data, SD-P11: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
- C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2.3 PEX TUBE AND FITTINGS

A. PEX Distribution System: ASTM F 877, SDR 9 tubing.

1. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.
2. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

2.4 PIPING JOINING MATERIALS

A. Solder Filler Metals: 95-5 Tin-Antimony, SilvaBrite 100. Include water-flushable flux according to ASTM B 813.

2.5 SPECIALTY VALVES

- A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.
- B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.6 ESCUTCHEONS

- A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.
- B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.
- C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.
- D. One Piece, Stamped Steel: Chrome-plated finish with setscrew.
- E. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge, setscrew.

2.7 SLEEVES

- A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

- D. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. See other Division 22 sections for Earthwork required for below slab or underground piping.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Where copper tubing is installed under building slab, install in with according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install domestic water piping with 0.25 percent slope downward toward drain and plumb.
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping adjacent to equipment and specialties to allow service and maintenance.
- J. Install piping to permit valve servicing. In areas of acoustic ceilings install valves no higher than 18 inches above the finished ceiling and no lower than 12 inches above the finished ceiling. Do not install valves above gypsum wall board ceilings. Do not install valves in walls or other in accessible spaces or cavities.
- K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.

- N. Install PEX piping with loop at each change of direction of more than 90 degrees. Install PEX piping in areas of finished ceilings. Do not install PEX piping in areas of exposed structure ceilings or where visible from the Sales Floor.
- O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. PEX Piping Joints: Join according to ASTM F 1807.
- F. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

- A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.
- B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

3. Base of Vertical Piping: MSS Type 52, spring hangers.
 - C. Support vertical piping and tubing at base and at each floor.
 - D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
 - E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - F. Install supports for vertical copper tubing every 10 feet.
 - G. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.
 - H. Install hangers for vertical PEX piping every 48 inches.
 - I. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.
- 3.6 CONNECTIONS
- A. Drawings indicate general arrangement of piping, fittings, and specialties.
 - B. Install piping adjacent to equipment and machines to allow service and maintenance.
 - C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
 - D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 1. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
 2. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.
- 3.7 ESCUTCHEON INSTALLATION
- A. Install escutcheons for penetrations of walls, ceilings, and floors.
 - B. Escutcheons for New Piping:
 1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
 2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, stamped steel with set screw.

3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece or split plate, stamped steel with set screw.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with polished chrome-plated finish.
5. Bare Piping in Equipment Rooms: One piece, stamped steel with set screw.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Piping Inspections:
 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 3. Re-inspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for re-inspection.
 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- C. Piping Tests:
 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 6. Prepare reports for tests and for corrective action required.
- D. Domestic water piping will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.9 CLEANING

- A. Clean and disinfect potable and non-potable domestic water piping as follows:
 - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Under-building-slab, domestic water, building service piping, NPS 3 and smaller, shall be the following:
 - 1. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings.
 - 2. PEX Tube, NPS 1 and smaller; fittings for PEX tube; no joints below slab.
- D. Aboveground domestic water piping, NPS 2 ½ (DN 65) and smaller, shall be one of the following:
 - 1. Hard copper tube, ASTM B 88, Type L wrought-copper solder-joint fittings; and soldered joints.

3.11 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller.
2. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers, atmospheric and continuous pressure.
2. Backflow preventers.
3. Temperature-actuated water mixing valves.
4. Strainers.
5. Hose bibbs.
6. Wall hydrants.
7. Drain valves.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data, SD-P12: For each type of product indicated.

1.4 QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. FEBCO; SPX Valves & Controls.
 - b. Watts Industries, Inc.; Water Products Div.
 - c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Woodford Manufacturing Company.
 - b. T&S Brass and Bronze Works, Inc.
2. Standard: ASSE 1001.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

C. Pipe-Applied, Continuous-Type Vacuum Breakers

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Watts Industries, Inc.; Water Products Div.
2. Standard: ASSE 1056.
3. Spill resistant (SVB)
4. Size: NPS 1/4 to NPS 3, as required to match connected piping.
5. Body: Bronze.
6. One piece modular check and float assembly.
7. Springs: stainless steel
8. Inlet and Outlet Connections: Female NPT threads.
9. Finish: Chrome plated.

2.2 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Watts Industries, Inc.; Water Products Div.; (model 9D)
 - b. Zurn Plumbing Products Group; Wilkins Div.; (model 760)
3. Standard: ASSE 1012.
4. Operation: Continuous-pressure applications.

5. Size: **NPS 3/4** and smaller.
6. Body: Bronze.
7. End Connections: Solder joint.
8. Finish: Rough bronze.

B. Reduced-Pressure-Principle Backflow Preventers :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Watts Industries, Inc.; Water Products Div.; (model 909 for water service entrance, do not use for scullery sinks)
 - b. Zurn Plumbing Products Group; Wilkins Div.; (model 975XL for water service entrance and for scullery sinks, three bay and single bay)
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 13 psig maximum, through middle 1/3 of flow range.
5. Size: NPS 2; NPS ¾ on scullery sinks.
6. Design Flow Rate: 50 gpm, for water service entrance; 10 gpm, for scullery sinks.
7. Body: Bronze for NPS 2 and smaller.
8. End Connections: Threaded for NPS 2 and smaller.
9. Configuration: Designed for horizontal, straight through flow.
10. Accessories:
 - a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller;
 - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.3 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Manufacturers: Provide the following:
 - a. Leonard Valve Company; (model TA-300-IT, for eyewash, only)
 - b. Leonard Valve Company, (model TM-28-E-RF, for hand sinks, lavatories and mop sinks)
 - c. Watts Water Safety (model L111, for chemical sanitizing equipment, only)
2. Standard: ASSE 1016.
3. Pressure Rating: 125 psig.
4. Type: Thermostatically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 120 deg F, for handsinks, lavatories and mop basins; 85 deg F, for eyewash stations; 80 deg F, for chemical sanitizing equipment.
9. Tempered-Water Design Flow Rate: 1 gpm, 20 gpm maximum at 30 psid for handsinks and lavatories; 4 gpm.
10. Valve Finish: Rough bronze.

2.4 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller;
3. End Connections: Threaded for NPS 2 and smaller.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.020 inch.
6. Drain: Factory-installed, hose-end drain valve.

2.5 HOSE BIBBS

A. Hose Bibbs, HWHB-2 and HWHB-3:

1. Manufacturers: Provide the following:
 - a. T&S Brass and Bronze Works, Inc.; (model B-720)
2. Standard: ASME A112.18.1 for sediment faucets.
3. Body Material: Bronze.
4. Seat: Bronze, replaceable.
5. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
6. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
7. Pressure Rating: 125 psig.
8. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
9. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
10. Finish for Service Areas: Chrome or nickel plated.
11. Finish for Finished Rooms: Chrome or nickel plated.
12. Operation for Equipment Rooms: Wheel handle or operating key.
13. Operation for Service Areas: Operating key.
14. Operation for Finished Rooms: Operating key.
15. Include operating key with each operating-key hose bibb.
16. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.6 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.

9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each, supply to mechanical equipment and systems, scullery sinks with chemical sanitizing equipment and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 1. Locate backflow preventers in same room as connected equipment or system.
 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
 3. Do not install bypass piping around backflow preventers.
- C. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
- D. Install balancing valves in locations where they can easily be adjusted.
- E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
 1. Install thermometers.
 2. Do not install above gypsum board ceilings or in inaccessible spaces.
- F. Install Y-pattern strainers for water on supply side of each backflow preventer.
- G. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and prepare test reports:
 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

- A. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following soil and waste, sanitary drainage and vent piping inside the building:
 - 1. Pipe, tube, and fittings.
 - 2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the code required working pressure.

1.3 SUBMITTALS

- A. Product data, SD-P18A, for adhesives and sealants used inside the weatherproofing system, including printed documentation of VOC content. Low-emitting materials standards are listed in Section 018115, "Sustainable Design Requirements".

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. PVC piping is the preferred material. Use cast iron or copper piping only when required by local code.
- B. Piping used in the project shall have NSF approval.
- C. Hub-and-Spigot, Cast-Iron Pipe and Fittings: ASTM A 74, Service class.
 - 1. Gaskets: ASTM C 564, rubber.
- D. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.
 - 1. Solvent: Solvent systems are not permitted.
 - 2. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

- a. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
- E. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought-copper, solder-joint fittings.
- F. Solid-Wall PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
- 1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
 - 2. Solvent Cement and Adhesive Primer:
 - a. Use PVC solvent cement that has a VOC content of 510g/L or less when calculated according to 40CFR59, Subpart D (EPA Method 24).
 - b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40CFR59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Above slab, soil, waste, and vent piping shall be the following:
- 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints; use PVC unless local code prevents its use.
 - 2. Service class, hub-and-spigot, cast-iron soil pipe and fittings; gaskets; and compression joints; use only where code required, in lieu of PVC.
 - 3. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints; use only where code required, in lieu of PVC.
 - 4. Copper DWV tube, copper drainage fittings, and soldered joints; use only where code required, in lieu of PVC, except for walk-in boxes.
 - 5. Walk-in box evaporator drain piping; copper DWV tube, connect to drain outlet with clear plastic tubing; all other fittings shall be copper drainage fittings and soldered joints. Trap condensate piping outside of box. See heat tracing specified in other Division 22 sections for heat tracing condensate lines.
- C. Below slab, soil, waste, and vent piping shall be the following:
- 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints; use PVC unless local code prevents its use.
 - 2. Service class, cast-iron soil pipe and fittings; gaskets; and compression joints; use only where code required, in lieu of PVC.
 - 3. Hubless cast-iron soil pipe and fittings; standard shielded, stainless-steel couplings; and hubless-coupling joints; use only where code required, in lieu of PVC.

4. Copper DWV tube, copper drainage fittings, and soldered joints; use only where code required, in lieu of PVC.

3.2 PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section "Common Work Results for Plumbing."
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 22 Section "Common Work Results for Plumbing."
- E. When cast iron pipe is required by code, install piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 1. Building Sanitary Drain: 1 percent downward in direction of flow for piping.
 2. Horizontal Sanitary Drainage Piping: 1 percent downward in direction of flow.
 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- I. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- J. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.
- K. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

- L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

- A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."
- B. Cast-Iron, Soil-Piping Joints, (when cast iron is required by code): Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
 - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- D. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
- B. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for cast-iron soil piping (when applicable) with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
- F. Install supports for vertical cast-iron soil piping (when applicable) every 15 feet.
- G. Install hangers for copper tubing (when applicable) with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

- H. Install supports for vertical copper tubing (when applicable) every 10 feet.
- I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
- J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.5 CONNECTIONS

- A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- B. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Sanitary Waste Piping Specialties."
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 22 Section "Sanitary Waste Piping Specialties."
 - 4. Equipment: Connect drainage piping as indicated.

3.6 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.
 - 1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 2. Prepare reports for tests and required corrective action.

3.7 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following sanitary drainage piping specialties:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Miscellaneous sanitary drainage piping specialties.

1.2 SUBMITTALS

- A. Product Data, SD-P19: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Cast-Iron Floor Cleanouts:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div., series 56050-2-22-41
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc., 4100-F-C series
 - c. Zurn Plumbing Products Group; Specification Drainage Operation, model ZN-1400-HD.
 - 2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
 - 3. Size: Same as connected branch.
 - 4. Type: Threaded, adjustable housing.
 - 5. Body or Ferrule: Cast iron.
 - 6. Clamping Device: Required.
 - 7. Outlet Connection: Threaded.
 - 8. Closure: Brass plug with tapered threads.
 - 9. Adjustable Housing Material: Cast iron with threads.
 - 10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
 - 11. Frame and Cover Shape: Round.

12. Top Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

B. Cast-Iron Wall Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Josam Company; Josam Div., series 58710
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc., series 4402C
 - c. Zurn Plumbing Products Group; Specification Drainage Operation, model Z-1441
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: as required to match connected piping.
5. Closure: Countersunk plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Basis-of-Design Product: Provide a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Zurn Plumbing Products Group; Specification Drainage Operation.
2. Basis of design models:
 - a. Type “A” floor drain: Zurn model ZN-415-HD-Y, Type B strainer, with sediment bucket.
 - b. Type “B” floor drain: Zurn model ZN-415-Y- (-4), Type B strainer, with sediment bucket (and funnel where indicated).
 - c. Type “F” floor sink: Zurn model Z1750-K-YS- (-3) with suspended sediment bucket (and $\frac{3}{4}$ grate where indicated).
 - d. Type “T” floor drains: Zurn model Z897-RFS-Y, stainless steel catch basin with sediment bucket and stainless steel heavy duty grate, 6 inches by 20 inches.
 - e. Type “Z” floor drain: Zurn model Z1662-IG-YA-G, dura-coated cast iron body, 6” bottom outlet heavy duty tractor grate, vandal-proof secured and with a sediment bucket.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from same material as installed piping. Include P-trap, riser section; and where required, increaser fitting.

2. Size: Same as connected waste piping with increaser fitting of size indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
 1. Position floor drains for easy access and maintenance.
 2. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring.
 3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- F. Assemble open drain fittings and install with top of hub **1 inch** above floor.
- G. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- H. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221523 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Pressure gauges.
7. Painting of above ground piping.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.

B. Natural-Gas System Pressure on the building roof: 2 psig. Verify existing condition/pressures.

C. Natural-Gas System Pressures within the Store: Two pressure ranges. Primary pressure is more than 0.5 psig but not more than 2 psig, and is reduced to secondary pressure of 0.5 psig or less.

D. Delegated Design: Design restraints and anchors for natural-gas piping and equipment, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.3 SUBMITTALS

A. Product Data, SD-P22A: For each type of product indicated.

B. Delegated-Design Submittal, SD-P22B: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
 - 4. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.
 - a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

2.2 PIPING SPECIALTIES

- A. Appliance Flexible Connectors:
 - 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
 - 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
 - 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
 - 4. Operating-Pressure Rating: 0.5 psig.
 - 5. End Fittings: Zinc-coated steel.
 - 6. Threaded Ends: Comply with ASME B1.20.1.
 - 7. Maximum Length: 72 inches
- B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
 - 1. Copper-alloy convenience outlet and matching plug connector.
 - 2. Nitrile seals.
 - 3. Hand operated with automatic shutoff when disconnected.
 - 4. For indoor applications.
 - 5. Adjustable, retractable restraining cable.
- C. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.

- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

- A. See "Aboveground Manual Gas Shutoff Valve Schedule" Article for where each valve type is applied in various services.
- B. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
 - 1. CWP Rating: 125 psig.
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 - 4. Tamperproof Feature: Locking feature for valves indicated "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
 - 6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- C. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.
 - 1. Manufacturers: Provide products by one of the following:
 - a. BrassCraft Manufacturing Company; a Masco company.
 - b. Conbraco Industries, Inc.; Apollo Div.
 - c. Lyall, R. W. & Company, Inc.
 - 2. Body: Bronze, complying with ASTM B 584.
 - 3. Ball: Chrome-plated brass.
 - 4. Stem: Bronze; blowout proof.
 - 5. Seats: Reinforced TFE; blowout proof.
 - 6. Packing: Separate packnut with adjustable-stem packing threaded ends.
 - 7. Ends: Threaded,
 - 8. CWP Rating: 600 psig.
 - 9. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 PRESSURE REGULATORS

- A. General Requirements:
 - 1. Single stage and suitable for natural gas.
 - 2. Steel jacket and corrosion-resistant components.
 - 3. Elevation compensator.
 - 4. End Connections: Threaded for regulators NPS 2 and smaller.

B. Pressure Regulators: Comply with ANSI Z21.80.

1. Basis-of-Design Product: Provide product indicated on Drawings as manufactured by:
 - a. Maxitrol Company.
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig.

2.6 PRESSURE GAGES

A. Basis-of-Design Product: Provide one of the following:

1. Ernst Gage Co.
2. Trerice, H. O. Co.
3. Weiss Instruments, Inc.

B. Direct-Mounting, Dial-Type Pressure Gages: Indicating-dial type complying with ASME B40.100.

1. Case: Dry type, plastic, 4-1/2-inch diameter.
2. Pressure-Element Assembly: Bourdon tube, unless otherwise indicated.
3. Pressure Connection: Brass, NPS 1/4, bottom-outlet type unless back-outlet type is indicated.
4. Movement: Mechanical, with link to pressure element and connection to pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Red metal.
7. Window: Glass or plastic.
8. Ring: Brass.
9. Accuracy: Grade B, plus or minus 2 percent of middle half of scale.
10. Vacuum-Pressure Range: 30-in. Hg of vacuum to 15 psig of pressure.
11. Range for Fluids under Pressure: Two times operating pressure.

C. Pressure-Gage Fittings:

1. Valves: NPS 1/4 brass or stainless-steel needle type.
2. Syphons: NPS 1/4 coil of brass tubing with threaded ends.

3. Snubbers: ASME B40.5, NPS 1/4 brass bushing with corrosion-resistant, porous-metal disc of material suitable for system fluid and working pressure.

2.7 SLEEVES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.8 IDENTIFYING

- A. Gas piping, indoor and outdoor, exposed and concealed, shall be painted OSHA Safety Yellow.
- B. Painting of piping is specified in Division 09.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

- A. Comply with the more restrictive clauses of NFPA 54 or the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Install fittings for changes in direction and branch connections.
- C. Install pressure gage downstream of utility meter and each pressure regulator.

3.2 INDOOR PIPING INSTALLATION

- A. Comply with the more restrictive clauses of NFPA 54 or the International Fuel Gas Code for installation and purging of natural-gas piping.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Arrange for pipe spaces, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.
- D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- G. Locate valves for easy access.

- H. Install natural-gas piping at uniform grade of ¼ inch per 15 feet down toward drip and sediment traps.
 - I. Install piping free of sags and bends.
 - J. Install fittings for changes in direction and branch connections.
 - K. Verify final equipment locations for roughing-in.
 - L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.
 - M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.
 - 1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.
 - N. Extend relief vent connections for regulators and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
 - O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
 - P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
 - Q. Connect branch piping from top or side of horizontal piping.
 - R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment.
 - S. Do not use natural-gas piping as grounding electrode.
 - T. Make final connections to equipment and appliances.
- 3.3 VALVE INSTALLATION
- A. Install manual gas shutoff valve for each gas appliance and ahead (upstream) of each regulator.
 - B. Install regulators and overpressure protection devices on the roof with maintenance access space adequate for servicing and testing.
- 3.4 PIPING JOINT CONSTRUCTION
- A. Ream ends of pipes and tubes and remove burrs.
 - B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:
1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

3.6 CONNECTIONS

- A. Connect to utility's gas main according to utility's procedures and requirements.
- B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.
- C. Install piping adjacent to appliances to allow service and maintenance of appliances.
- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 FIELD QUALITY CONTROL

- A. Test, inspect, and purge natural gas according to the more restrictive requirements of NFPA 54 or the International Fuel Gas Code and authorities having jurisdiction.
- B. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.8 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be the following:
1. Steel pipe with malleable-iron fittings and threaded joints.

3.9 INDOOR PIPING SCHEDULE

- A. Aboveground, branch piping shall be the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.

3.10 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 1/2 at service meter shall be the following:
 - 1. One-piece, bronze ball valve with bronze trim.
- B. Distribution piping valves for pipe sizes NPS 2 1/2 and smaller shall be the following:
 - 1. One-piece, bronze ball valve with bronze trim.
- C. Valves in branch piping for single appliance shall be one of the following:
 - 1. One-piece, bronze ball valve with bronze trim.

END OF SECTION 231123

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Faucets for lavatories and hand sinks.
2. Faucets, pre-rinse units and hose bibbs for scullery sinks, (single and three compartment)
3. Protective shielding guards.
4. Stainless steel hand sinks.
5. Stainless steel scullery sinks, (single and three compartment).
6. Kitchen sinks.
7. Mounting and plumbing of Owner furnished Chemical sanitizing equipment.

B. Related Sections include the following:

1. Division 22 Section "Emergency Plumbing Fixtures."

1.2 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. FRP: Fiberglass-reinforced plastic.
- D. PMMA: Polymethyl methacrylate (acrylic) plastic.
- E. PVC: Polyvinyl chloride plastic.
- F. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public

Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible. Provide the same manufacturer for each product specified throughout.

PART 2 - PRODUCTS

2.1 BEVERAGE CENTER SINK

A. Associates Lounge and Pharmacy Sinks:

- 1. Manufacturers: Provide products of one of the following:
 - a. Elkay Manufacturing Co.
 - b. Just Manufacturing Company
- 2. Description: One-bowl, counter-mounting 18 ga., type 304 (18-8) stainless-steel sink.
 - a. Associates' Lounge and Pharmacy: Model indicated on the drawings.
 - 1. Overall Dimensions: 17 inches by 16 inches by 6 inches
 - 2. Drain location: Center.
 - 3. Drain Piping: NPS 1-1/2 chrome-plated, cast-brass P-trap; 0.045-inch-thick tubular brass waste to wall; and wall escutcheon(s).

2.2 BEVERAGE CENTER SINK

Faucets:

Manufacturer:

T & S Brass and Bronze Works, Inc.

Model B-1120 with B-WH-4 wrist blade handles, and B-0199-01F10 aerator for Associates' Lounge and Pharmacy sinks.

Body Material: Commercial, solid brass.

- b. Finish: Polished chrome plate.
- c. Maximum Flow Rate: 1.0 gpm, unless otherwise indicated.
- d. Mixing Valve: Two-lever handle.
- e. Centers: 8 inches Three hole.
- f. Mounting: Deck, exposed.

- g. Handle(s): Wrist blade, 4 inches.
- h. Inlet(s): NPS 1/2 male shank.
- i. Spout Type: Swing, round tubular.
- j. Spout Outlet: 0.9 gpm aerator.
- k. Vacuum Breaker: Not required.
- l. Operation: Non-compression, manual.
- m. Drain: Grid.
- n. Service Valves: Provide for cold and hot water supply lines.

2.3 PREPARATION AREA HANDWASH SINK

A. Handwash sink:

- 1. Manufacturer:
 - a. Aero, only, no others permitted.
- 2. Description: Model indicated on the drawings. NSF approved, one-bowl, pedestal, 16 ga., type 304 stainless-steel sink.
 - a. Finish: #4 polish.
 - b. Foot pedal operated.
 - c. Rigid Gooseneck spout with aerator, 1.0 gpm, flow restricted.
 - d. Drain with stainless steel basket and tail piece.
 - e. Cast brass P-trap.
 - f. Provide eye wash attachment where indicated.
 - g. Service valves: Provide service valve for tempered water supply.
 - h. Tempering Device: Specified in other Division 22 sections.

2.4 SCULLERY SINKS

A. Sink:

- 1. Manufacturer:
 - a. Aero, only, no others permitted.
- 2. Description: Models indicated on the drawings. NSF approved, 16 ga., type 304 stainless-steel sink.
 - a. Finish: #4 polish.
 - b. Hemmed rolled edge and backsplash.
 - c. Legs: 1-5/8 inch O.D. 16 ga., type 304 stainless steel with adjustable impact resistant white metal feet.
 - d. Bowls: Model number indicates bowl width and length dimensions. Bowls are 14 inches deep. Bowls shall have 3/4 inch radius, coved corners.
 - e. Faucet Arrangement: Single faucet for single compartment sinks. Two faucets for three compartment sinks.
 - f. Drainboards: As indicated on the drawings. 24 inches wide fabricated of 16 ga., type 304 stainless steel, with the same finish. Heliarc welded to the sink. Rolled

edges to prevent spillage. ¾ inch positive drainage pitch to sink bowl, eliminating standing water.

2.5 SCULLERY SINK FAUCETS AND ACCESSORIES

A. Faucet:

1. Manufacturer:
 - a. T&S Brass and Bronze Works, only, no others permitted.
2. Trim for single compartment sinks: Provide model B-0133-08C low-flow pre-rinse unit with B-WH-4 wrist blade handles, model B-109 wall bracket, model B-156 add-on faucet, with B-0199-01 aerator, and B-WH-4 wrist blade handles.
 - a. Body Material: Commercial, solid brass.
 - b. Finish: Polished chrome plate.
 - c. Maximum Flow Rate: Faucet, 2.2 gpm, unless otherwise indicated.
 - d. Mixing Valve: Two-lever handle.
 - e. Centers: 8 inches Two hole.
 - f. Mounting: Wall, exposed.
 - g. Handle(s): Wrist blade, 4 inches.
 - h. Inlet(s): NPT 1/2 female inlets.
 - i. Pre-rinse unit: 35-1/2 inches high, 15 inches overhand, hose spring body, overhead spring, low flow spray valve. Provide T & S Brass and Bronze Works model B-0044V9 flexible hose with vacuum breaker. T & S Brass B-108-C spray head. Maximum flow rate 1.2 gpm.
 - j. Spout Type (add-on faucet): 12 inches swing, round tubular.
 - k. Spout Outlet: 2.2 low flow aerator.
 - l. Vacuum Breaker: See sub-paragraph i, above.
 - m. Operation: Non-compression, manual.
 - n. Drain: Aero model S-20 twist type leverwaste.
 - o. Service Valves: Provide for cold and hot water supply lines.
 - p. Check valve: Provide spring type check valve on cold water supply line. Locate downstream of service valve.
3. Trim for three compartment sinks, (two faucet sets): One set shall consist of model B-0133-08C low flow pre-rinse unit with B-WH-4 wrist blade handles, model B-109 wall bracket, model B-156 add-on faucet, w B0199-01 aerator, with B-WH-4 wrist blade handles. The second faucet set shall consist of model B-231, 12 inches swing spout, with B-0199-01 aerator, and B-WH-4 wrist blade handles. Provide under the sink T&S Brass model B-720 sill faucet. Also provide under the sink a backflow preventer specified in othe Division 22 sections.
 - a. Body Material: Commercial, solid brass.
 - b. Finish: Polished chrome plate.
 - c. Maximum Flow Rate: Faucet, 2.2 gpm, unless otherwise indicated.
 - d. Mixing Valve: Two-lever handle.
 - e. Centers: 8 inches Two hole.
 - f. Mounting: Wall, exposed.
 - g. Handle(s): Wrist blade, 4 inches.

- h. Inlet(s): NPT 1/2 male inlets.
- i. Pre-rinse unit: 35-1/2 inches high, 15 inches overhand, hose spring body, overhead spring, low flow spray valve. Provide T & S Brass and Bronze Works model B44V9 flexible hose with vacuum breaker. T & S Brass B-108-C spray head. Maximum flow rate 1.2 gpm.
- j. Spout Type (add-on faucet): 12 inches swing, round tubular.
- k. Spout Outlet: 2.2 low flow aerator.
- l. Vacuum Breaker: Required on undersink hose bibbs.
- m. Operation: Non-compression, manual.
- n. Drain: Aero model S-20 twist type leverwastes, one for each bowl.
- o. Under-sink sill faucet.
- p. Service Valves: Provide for cold and hot water supply lines.
- q. Check valve: Provide spring type check valve on cold water supply line. Locate downstream of service valve.
- r. Backflow preventer: Provide a reduced pressure zone (RPZ) backflow preventer for each three compartment sink, on the hot water line to isolate the chemical sanitizing unit. The RPZ backflow preventer is specified in other Division 22 sections.
- s. Chemical sanitizing unit: Furnished by Hannaford Bros. Installed by the contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- C. Install wall-mounting fixtures with tubular waste piping attached to supports.
- D. Install fixtures level and plumb according to roughing-in drawings.
- E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- F. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- G. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- H. Install flushometer valves for accessible water closets and urinals with override button mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach. Install sensor in location recommended by flushometer valve manufacturer.
- I. Install toilet seats on water closets.

- J. Install faucet-spout fittings with specified flow rates. Include adapters if required.
- K. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- L. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- M. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.4 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities.

END OF SECTION 224000

SECTION 224500 - EMERGENCY PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following emergency plumbing fixtures:
 - 1. Eyewash equipment.
 - 2. Water-tempering equipment.
- B. See Division 22 Section "Domestic Water Piping Specialties" for backflow preventers.

1.2 DEFINITIONS

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Tepid: Moderately warm.

1.3 SUBMITTALS

- A. Product Data, SD-P29: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.

1.4 QUALITY ASSURANCE

- A. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 EYEWASH EQUIPMENT

- A. Eyewash Equipment, EW-1:

1. Manufacturers: Provide products by one of the following:
 - a. Bradley Corporation.
 - b. Guardian Equipment Co., basis of design.
 - c. Haws Corporation.
2. Description: Plumbed, deck mounted eyewash equipment. Two head, hose drench without receptor. Flip-up dust cover on each head. Polished chrome plated brass valve. Provide one for each sink SK-DE indicated on the drawings.
 - a. Capacity: Deliver potable water at rate not less than 0.4 gpm for at least 15 minutes.
 - b. Supply Piping: NPS 3/8 pvc hose.
 - c. Control-Valve Actuator: Squeeze valve.
 - d. ANSI compliant identification sign: Provide.

2.2 WATER-TEMPERING EQUIPMENT

A. Water-Tempering Equipment:

1. Manufacturers: Provide the following:
2.
 - a. Leonard Valve Company.
3. Description: Factory-fabricated, hot- and cold-water-tempering equipment with thermostatic mixing valve.
 - a. Thermostatic Mixing Valve: Designed to provide 85 deg F tempered, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.
- B. Install fixtures level and plumb.
- C. Fasten fixtures to substrate.
- D. Install shutoff valves in water-supply piping to fixtures. Use ball valve for shut off valve. Install valves chained or locked in open position if permitted. Install valves in locations where they can easily be reached for operation. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."
 1. Exception: Omit shutoff valve on supply to group of plumbing fixtures that includes emergency plumbing fixture.

2. Exception: Omit shutoff valve on supply to emergency equipment if prohibited by authorities having jurisdiction.
- E. Install thermometers in supply and outlet piping connections to water-tempering equipment. Thermometers are specified in Division 22 Section "Meters and Gages for Plumbing Piping."
- F. Install escutcheons on piping wall and deck penetrations in exposed, finished locations. Escutcheons are specified in Division 22 Section "Common Work Results for Plumbing."
- G. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- H. Connect hot- and cold-water-supply piping to hot- and cold-water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures.
- I. Indirectly connect emergency plumbing fixture receptors without trapped drain outlet to sanitary piping.
- J. Adjust or replace fixture flow regulators for proper flow.
- K. Adjust equipment temperature settings.

END OF SECTION 224500

SECTION 230400 HVAC SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Summary: Briefly and without force and effect on contract documents, mechanical work can be generally summarized as (but is not necessarily limited to) the following to the work described in this Section and Division 23 Sections.
- B. General Work: General work associated with HVAC systems and equipment, and to be performed as HVAC work, includes earthwork (excavating, backfill and compaction of sub-grade) piping, hvac equipment, materials, pipe sleeves, pipe supports, ductwork supports, anchors, meters, gages, electrical disconnects, motor starters, vibration isolation, sound isolation, drip pans, access panels, welding, identification, coordination drawings, record drawings, installation permits, tests, inspection, cutting-and-patching work, utility connections, start-up of systems, training of Owner's operating personnel, operating and maintenance manuals, operating permits, final cleaning and lubricating of HVAC work, continued operation of certain equipment for specified periods after Owner's acceptance or occupancy, and similar work. All work must be in conformance with all state and local codes.
 - 1. The HVAC contractor shall provide interconnecting refrigerant piping, service valves, TXV's, liquid line solenoids, sight glasses, evaporator pressure regulators (if required), filter/driers and other devices between the condensing unit and the air handler. The HVAC contractor shall be responsible for pressure testing the piping, evacuating and charging the system. Verify the type of refrigerant required with the unit nameplate and provide an adequate amount of refrigerant to properly charge the system. The HVAC contractor shall be responsible for start up of the units.
- C. The HVAC Contractor shall be responsible for notifying and coordinating with the Testing, Adjusting and Balancing (TAB) Contractor for pre-balancing inspections. The inspections shall be timed when the installation is nearing completion and before any work is concealed behind ceilings or inaccessible spaces. The inspection will look for flex duct conditions; for the completeness of balancing and volume dampers; diffuser, register and grille installation; the installation of hydronic control valves and pumps where applicable. Work found to be deficient as a result of the inspections shall be corrected before testing, adjusting and balancing work commences. When the installation is complete and ready for testing, adjusting and balancing, the HVAC Contractor shall notify, in writing, HBC's Construction Project Manager that testing adjusting and balancing work can commence and be completed. Any deficiency of work found after testing, adjusting and balancing work begins shall be corrected. If the deficiency of the work delays the completion of testing, adjusting and balancing work the responsible trade Contractor shall be back charged all additional charges encumbered by the Owner.
- D. Related Sections include the following:
 - 1. Section 018115, "Sustainable Design Requirements"
 - a. Zero use of CFC and HCFC refrigerants.
 - b. Low Emitting Materials, (low VOC adhesives and sealants).
 - c. Low Emitting Materials, (low VOC paints and coatings).

1.2 HEATING, VENTILATING, AND AIR CONDITIONING

- A. Provide HVAC items indicated on plans and in the specifications. Installation shall be according to Manufacturer's recommendations and in conformance to applicable codes.
- B. Clean ductwork exterior and where ductwork is concealed seal all joints using Hardcast 550 or equivalent. Ductwork exposed above the Sales Floor need not be sealed.
- C. New units, placed into service before the end of construction, shall have all coils cleaned. Include all Dx and hydronic coils with-in the unit and any duct mounted coils associated with the unit. Coils shall be cleaned after all major construction activity ceases and prior to balancing and the Grand Opening of the store. Coil cleaning shall be performed by NorthEast Coil, Inc., Burnham Road, Limerick, Maine 04048; telephone, 800.793.9530; email, www.northeastcoil.com.
- D. Exhaust hood systems serving the deli and warewashing areas.
- E. Exhaust systems as indicated on the drawings and in the specifications.
- F. Automatic Temperature Controls will be interfaced with Owner's automatic control system by the Controls Contractor. The HVAC Contractor shall provide damper actuators for motor operated dampers and control valves for hydronic equipment requiring control valves. The Controls Contractor shall wire damper actuators and control valves.
- G. Pre-start-up meeting, scheduling of start-up, and performing the start-up with all involved crafts (Refrigeration, Electrical, HVAC, Test and Balance personnel, and HBC representative to be present.)
- H. Assist the Testing, Adjusting and Balancing (TAB) Contractor in testing, adjusting, and balancing systems. Testing, adjusting and balancing is specified in section 15850, "Testing, Adjusting and Balancing". The HVAC Contractor shall be responsible for replacing roof top equipment air filters used during construction with clean unused filters at the time balancing commences. The HVAC Contractor shall be responsible for changing fan sheaves, for belt driven equipment, including equipment furnished by the Owner, as required to obtain proper air flows.

1.3 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.
- B. Extend all grease fittings to an accessible location.

1.4 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be installed.

1.5 COORDINATION

- A. The HVAC Contractor shall acquaint himself with space requirements of other trades and call to the Architect/Engineer's attention any conflicts noted prior to performing any work. If work is started without notice to the Architect/Engineer, Contractor assumes responsibility for any work that has to be done over.
- B. HVAC Contractor shall have materials on the job and erected in conformance with building work schedule and in full coordination with other trades. Coordination with the Electrical Contractor to assure proper power supply to each component is the responsibility of the HVAC contractor.
- C. Coordinate installation of HVAC equipment and materials with all other building components.
- D. Verify all dimensions by field measurements.
- E. Arrange for chases, slots, and openings in other building components to allow for HVAC installations.
- F. Coordinate the cutting and patching of building components to accommodate the installation of HVAC equipment and materials.
- G. Where mounting heights are not detailed or dimensioned, install HVAC services and overhead equipment to provide the maximum headroom possible consistent with being serviceable.
- H. Install HVAC equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- I. Coordinate the installation of HVAC materials and equipment above ceiling with suspension system, light fixtures, and other installations.
- J. Coordinate connections of HVAC systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.6 CONTRACT DRAWINGS

- A. Contract drawings are in part diagrammatic, intended to convey the scope of work and indicated general arrangements of equipment, ducts, piping, and approximate sizes and locations of equipment and outlets. HVAC Contractor shall familiarize himself with all conditions affecting his work and shall verify spaces in which his work will be installed.
- B. Where job conditions require reasonable changes in indicated locations and arrangement, make such changes without extra cost to Owner.
- C. The HVAC Contractor shall carefully study and compare all contract drawings, specifications, and other instructions and shall at once report to the Architect/Engineer any error, inconsistency, deviation from actual conditions, or omission which he may discover.

1.7 CUTTING AND PATCHING

- A. Perform cutting, fitting, and patching of HVAC equipment and materials required to:
 - 1. Uncover Work to provide for installation of ill-timed Work;
 - 2. Remove and replace defective Work;
 - 3. Remove and replace Work not conforming to requirements of the Contract Documents;
 - 4. Install equipment and materials in existing structures;
 - 5. Upon written instructions from the Architect/Engineer, uncover and restore work to provide for Architect/Engineer observation of concealed Work.
- B. Do not endanger or damage installed Work through procedures and processes of cutting and patching.
- C. Arrange for repairs required to restore other Work, because of damage caused as a result of HVAC installations.
- D. No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.
- E. Cut, remove and legally dispose of any indicated HVAC equipment, components, and materials as required.
- F. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

1.8 SEQUENCING AND SCHEDULING

- A. Construct work in sequence under the provisions of Division 01 Sections.
- B. All concealed piping conveying hydronic water shall be fully charged and leak-tested prior to completion of the wall or ceiling enclosures. The cost of repairing damages to other Work during charging and leak testing shall be the responsibility of the HVAC Contractor. If permanent site water is not available at this time, temporary water shall be used to complete this testing.

1.9 NAMEPLATE DATA

- A. Provide a permanent nameplate on each item of power operated HVAC equipment, indicating manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliance's, and similar essential data. Locate nameplates in an accessible location.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for district identifications; adequately packaged and protected to prevent damage during shipment, storage and handling.
- A. Store and protect products in accordance with Division 01 Sections.

1.11 SUBMITTALS

- A. Provide submittals specified in the various section of Division 23.
- B. Provide submittals in accordance with Section 013300 Submittal Procedures.
- C. Documentation of installation in accordance with Section 018115, “Sustainable Design Requirements”, along with product documentation and testing.

1.12 RECORD DOCUMENTS, (SD-H1)

- A. Maintain record documents in accordance with requirements. Record documents shall be available for inspections and reference at any time during construction.
- B. Mark a set of drawings to indicate any revisions to piping, size and location both exterior and interior; including locations of control devices, filters, and similar units requiring periodic maintenance of repair; actual equipment locations, dimensioned for column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, tanks, etc.); and Change Orders.
- C. Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

1.13 OPERATION AND MAINTANENCE DATA

- A. Prepare and submit, at the conclusion of the project, operation and maintenance manuals for rooftop air handling units, condensing units, blower coil units, fan coils, exhaust fans and kitchen hoods.
 - 1. Include the following data:
 - a. Manufacturer’s name and equipment model and serial numbers.
 - b. Manufacturer’s O&M manuals, for all equipment provided.
 - c. Fan and pump curves
 - d. Motor nameplate data for fans, pumps compressors, (include full load amperage, lock rotor amperage, motor design code letter, voltage, rpm).
 - e. Filter data, manufacturer’s name, model number and MERV number.
 - f. Refrigerant type and final charge for each ac system.

END OF SECTION 230400

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Equipment installation requirements common to equipment sections.
 - 2. Supports and anchorages.
 - 3. Pre-testing, adjusting and balancing (TAB) inspections.

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, unheated spaces immediately below roof, spaces below ceilings, and unexcavated spaces.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings.

1.3 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components.

- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping of other trades.

3.2 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

3.3 PRE-TESTING, ADJUSTING AND BALANCING (TAB) INSPECTIONS

- A. The HVAC Contractor shall be responsible for notifying and coordinating with the Testing, Adjusting, Balancing (TAB) Contractor for pre-balancing inspections. The inspections shall be timed when the installation is nearing completion and before any work is concealed behind ceilings or inaccessible spaces. The inspection will look for flex duct conditions; for the completeness of balancing and volume dampers; diffuser, register and grille installation; the installation of hydronic control valves and pumps where applicable. Work found to be deficient as a result of the inspections shall be corrected before testing, adjusting and balancing work commences. When the installation is complete and ready for testing, adjusting and balancing, the HVAC Contractor shall notify, in writing, Hannaford Bros. Co. Construction Project Manager that testing, adjusting and balancing work can commence and be completed, before the stipulated project Turn Over date. Any deficiency of work found after testing, adjusting and balancing work begins shall be corrected. If the deficiency of the work delays the completion of testing, adjusting and balancing work the responsible trade Contractor shall be back charged all additional charges encumbered by Hannaford Bros. Co.

END OF SECTION 230500

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.

- I. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Provide internal thermal protection complying with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230553 - IDENTIFICATION FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - a. Exhaust fans.

1.2 SUBMITTAL

- A. Product Data, SD-H4: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Black.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 7. Fasteners: Stainless-steel self-tapping screws.
 - 8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper.
- D. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

- B. Letter Color: Red .
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes TAB to produce design objectives for the following:
 - 1. Air Systems:
 - a. Constant-volume air systems.
 - 2. HVAC equipment quantitative-performance settings.
 - 3. Kitchen hood airflow balancing.
 - 4. Reporting results of activities and procedures specified in this Section.
- B. Pre-testing, adjusting and balancing inspections shall be performed to identify deficiencies in HVAC installation prior work being concealed and to balancing work commencing. The HVAC Contractor shall schedule and coordinate the time of inspection.

1.2 MANDATORY CONDITIONS OF THE GENERAL CONTRACT

- A. Hannaford Bros. Co. shall require the General Contractor to sign an agreement for testing, Adjusting and Balancing work with:
 - 1. Mr. Rick Habib
Air Solutions & Balancing, LLC
40 King St., Unit 1
Auburn, NH 03032
- B. It is Hannaford Bros. Co.'s intent to be proprietary with the Testing, Adjusting and Balancing Contractor (TAB Contractor). The TAB Contractor shall be under Contract to the General Contractor only and shall be independent of the mechanical contractor, refrigeration contractor or plumbing contractor.

1.3 SUBMITTALS

Certified TAB Reports, SD-H5: Submit, to Hannaford Bros. Co., two copies of reports prepared, as specified in this Section, on approved forms certified by TAB firm.

1.4 QUALITY ASSURANCE

- A. System balance shall be performed in accordance with AABC National Standards or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- B. Certification of TAB Reports: Certify TAB field data reports. This certification includes the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.

- C. TAB Report Forms: Use standard forms from TAB firm's forms.

1.5 PROJECT CONDITIONS

Owner Occupancy: Owner will occupy completed areas of building before store Grand Opening. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6 COORDINATION

- A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
 - 1. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- B. Examine design data.
- C. Examine equipment performance data including fan and pump curves.
- D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.
- E. Examine system and equipment test reports.
- F. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.
- G. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.
- H. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

- I. Examine equipment for installation and for properly operating safety interlocks and controls.
- J. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Complete system readiness checks and prepare system readiness reports. Verify the following:
 - 1. Permanent electrical power wiring is complete.
 - 2. Automatic temperature-control systems are operational.
 - 3. Equipment and duct access doors are securely closed.
 - 4. Balance, smoke, and fire dampers are open.
 - 5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 6. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.
- C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Determine the best locations in main and branch ducts for accurate duct airflow measurements.
- C. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.
- D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- E. Check dampers for proper position to achieve desired airflow path.
- F. Check for airflow blockages.

- G. Check condensate drains for proper connections and functioning.
- H. Check for proper sealing of air-handling unit components.
- I. Check for proper sealing of air duct system.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure fan static pressures to determine actual static pressure as follows:
 - a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 2. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.
 - 3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
 - 4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
 - 5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.
 - 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
 - 1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

- a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure terminal outlets and inlets without making adjustments.
 1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.
 1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 1. Manufacturer, model, and serial numbers.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

3.7 PROCEDURES FOR TEMPERATURE MEASUREMENTS

- A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.
- B. Measure indoor wet- and dry-bulb temperatures every other hour for a period of two successive eight-hour days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied.
- C. Measure outside-air, wet- and dry-bulb temperatures.

3.8 PROCEDURES FOR COMMERCIAL KITCHEN HOODS

- A. Measure, adjust, and record the airflow of each kitchen hood. For kitchen hoods designed with integral makeup air, measure and adjust the exhaust and makeup airflow. Measure airflow by duct Pitot-tube traverse. If a duct Pitot-tube traverse is not possible, provide an explanation in the report of the reason(s) why and also the reason why the method used was chosen.
 - 1. Install welded test ports in the sides of the exhaust duct for the duct Pitot-tube traverse. Install each test port with a threaded cap that is liquid tight.
- B. After balancing is complete, do the following:
 - 1. Measure and record the static pressure at the hood exhaust-duct connection.
 - 2. Measure and record the hood face velocity. Make measurements at multiple points across the face of the hood. Perform measurements at a maximum of 12 inches between points and between any point and the perimeter. Calculate the average of the measurements recorded. Verify that the hood average face velocity complies with the Contract Documents and governing codes.
 - 3. Check the hood for capture and containment of smoke using a smoke emitting device. Observe the smoke pattern. Make adjustments to room airflow patterns to achieve optimum results.
- C. Visually inspect the hood exhaust duct throughout its entire length in compliance with authorities having jurisdiction. Begin at the hood connection and end at the point it discharges outdoors. Report findings.
 - 1. Check duct slopes as required.
 - 2. Verify that duct access is installed as required.
 - 3. Verify that point of termination is as required.
 - 4. Verify that duct air velocity is within the range required.
 - 5. Verify that duct is within a fire-rated enclosure.
- D. Report deficiencies.

3.9 TOLERANCES

- A. Set HVAC system airflow and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
 - 2. Air Outlets and Inlets: 0 to minus 10 percent.

3.10 FINAL REPORT

- A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.
- B. Include a certification sheet in front of binder.
 - 1. Include a list of instruments used for procedures, along with proof of calibration.

- C. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:
1. Title page.
 2. Name and address of TAB firm.
 3. Project name.
 4. Project location.
 5. Report date.
 6. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 7. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 8. Nomenclature sheets for each item of equipment.
 9. Data for terminal units, including manufacturer, type size, and fittings.
 10. Notes to explain why certain final data in the body of reports varies from indicated values.
 11. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outside-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
 - a. Flexible elastomeric.
 - b. Mineral fiber.

1.2 SUBMITTALS

- A. Product Data, SD-H6: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
1. Products: Provide one of the following:

- a. Aeroflex USA Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. RBX Corporation; Insul-Sheet 1800.
- E. Mineral-Fiber, Preformed Pipe Insulation:
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Micro-Lok.
 - b. Knauf Insulation; 1000 Pipe Insulation.
 - c. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- 1. Products: Provide one of the following:
 - a. CertainTeed Corp.; Duct Wrap.
 - b. Knauf Insulation; Duct Wrap.
 - c. Owens Corning; All-Service Duct Wrap.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top, except for exposed outdoor duct and round duct) and bottom of horizontal runs.
- E. Keep insulation materials dry during application and finishing.
- F. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

- G. Install insulation with least number of joints practical.
- H. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- I. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- J. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at **2 inches** o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and fittings.
- K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- N. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Access doors.

3.3 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

3.4 MINERAL-FIBER INSULATION INSTALLATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 - 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 - 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 - 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 - 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
 - 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 - 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.

7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch-wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.5 FIELD-APPLIED JACKET INSTALLATION

- A. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Inspect ductwork, randomly selected by Hannaford Bro. Co. Construction Project Manager, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
 2. Inspect field-insulated equipment, randomly selected by Hannaford Bro. Co. Construction Project Manager, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.7 DUCT INSULATION SCHEDULE, GENERAL

- A. New Plenums and Ducts Requiring Insulation:
 1. Indoor, concealed supply.
 2. Indoor, concealed return.
 3. Indoor, concealed oven exhaust.

- B. Items Not Insulated:

1. Type I hood, kitchen exhaust duct.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.8 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- B. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.
- C. Concealed, Exhaust-Air Duct, and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 1.5-lb/cu. ft. nominal density.

END OF SECTION 230700

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Division 23 Section Commercial Kitchen Hoods

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated.

1. Static-Pressure Classes:

- a. Supply Ducts: 2-inch wg.
- b. Return Ducts (Negative Pressure): 1-inch wg.
- c. Exhaust Ducts (Negative Pressure): 1-inch wg.
- d. Exhaust Ducts, Type I hoods: 2 inches wg (250 Pa)

2. Leakage Class:

- a. Rectangular Supply-Air Duct: 6 cfm/100 sq. ft. at 1-inch wg.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting seismic restraints.

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Pittsburg hammer. Fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Provide products by one of the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 1. Galvanized Coating Designation: G60.
 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
 1. Hood grease ducts shall conform to NFPA 96, "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations", latest edition. As a minimum duct work shall be 16 gage carbon steel with liquid tight welded joints
- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System, concealed ducts, only.:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

C. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

E. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

E. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

- A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.
- B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts. Locate access panel on top or sides of duct a minimum of 1-1/2 inches from bottom of duct.

3.3 SEAM AND JOINT SEALING

- A. Seal duct seams and joints for duct static-pressure and leakage classes specified in "Performance Requirements" Article, according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements," unless otherwise indicated.

- B. Seal Classes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 1-2, "Standard Duct Sealing Requirements."

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as follows:
 - 1. Commercial Kitchen Hood Exhaust Ducts: Comply with NFPA 96.
 - a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
 - b. Concealed: Carbon-steel sheet.
 - c. Welded seams and joints.
- B. Intermediate Reinforcement:
 - 1. Galvanized-Steel Ducts: Galvanized steel.
 - 2. Stainless-Steel Ducts: Galvanized steel.
- C. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 2 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 1.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.5 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.
- D. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Turning vanes.
 - 3. Duct-mounted access doors.
 - 4. Flexible connectors.
 - 5. Flexible ducts.
 - 6. Duct accessory hardware.

1.2 SUBMITTALS

- A. Product Data, SD-H13: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and No. 4 finish for exposed ducts.
- D. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

- E. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. McGill AirFlow LLC.
 - d. Ruskin Company.
 - 2. Standard leakage rating, with linkage outside airstream.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Hat-shaped, galvanized -steel channels, 0.064-inch minimum thickness.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 - 6. Blade Axles: Stainless steel.
 - 7. Bearings:
 - a. Stainless-steel sleeve.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 8. Tie Bars and Brackets: Galvanized steel.

2.3 TURNING VANES

- A. Manufacturers: Provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. SEMCO Incorporated.
 - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

- D. Vane Construction: Single wall.

2.4 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Ductmate Industries, Inc.
3. Greenheck Fan Corporation.
4. McGill AirFlow LLC.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
 - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.5 FLEXIBLE CONNECTORS

- A. Manufacturers: Provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

- B. Materials: Flame-retardant or noncombustible fabrics.

- C. Coatings and Adhesives: Comply with UL 181, Class 1.

- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch-wide, 0.028-inch-thick, galvanized sheet steel or 0.032-inch-thick aluminum sheets. Provide metal compatible with connected ducts.

- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.

2.6 FLEXIBLE DUCTS

- A. Manufacturers: Provide products by one of the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. McGill AirFlow LLC.
 - 3. Anco Products, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.
- C. Flexible Duct Connectors:
 - 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
- D. Flexible duct shall not be used for offsets or elbows. Straight runs, only, with a maximum length of 5'-0".

2.7 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install heavy duty volume dampers each side of the first tee fitting downstream of roof-top unit discharge.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Downstream from manual volume dampers, control dampers, turning vanes, and equipment.
 - 3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 4. At each change in direction and at maximum 50-foot spacing.
 - 5. Upstream of turning vanes.
 - 6. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.
- I. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body plus Ladder Access: 25 by 17 inches.
- J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. Connect diffusers, linear diffuser boots and grilles to low-pressure ducts with maximum 60-inch lengths of flexible duct clamped in place. Square neck diffusers and grilles shall be provided with square to round metal transitions to which the flexible duct shall be connected.
- M. Connect flexible ducts to metal ducts with draw bands. Do not form elbows using flexible duct. Do not install flexible duct on the suction side of fans, including exhaust fans.
- N. Install duct test holes where required for testing and balancing purposes.

- O. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Centrifugal roof ventilators.

1.2 SUBMITTALS

- A. Product Data, SD-H14A: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:
- B. Shop Drawings, SD-H14B: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1.3 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. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.
- C. UL Standard: Power ventilators shall comply with UL 705.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

- A. Manufacturers: Provide products by one of the following:
 - 1. Acme Engineering & Mfg. Corp.
 - 2. Carnes Company HVAC.
 - 3. Greenheck.
- B. Description: Direct- or belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
- C. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.

1. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- D. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- E. Belt-Driven Drive Assembly: Resiliently mounted to housing, with the following features:
 1. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 2. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 3. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 4. Fan and motor isolated from exhaust airstream.
- F. Accessories:
 1. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
 2. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 3. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
- G. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch-thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
 1. Configuration: Self-flashing without a cant strip, with mounting flange.
 2. Overall Height: As scheduled
 3. Pitch Mounting: Manufacture curb for level roof slope.
 4. Metal Liner: Galvanized steel.
 5. Burglar Bars: 1/2-inch-thick steel bars welded in place to form 6-inch squares.
 6. Damper Box: yes.
 7. Mounting Pedestal: Galvanized steel with removable access panel.
 8. Vented Curb: Unlined with louvered vents in vertical sides.

2.2 MOTORS

- A. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- B. Enclosure Type: Open drip proof.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Secure roof fans to roof curbs with cadmium-plated hardware. Refer to Division 07 Section "Roof Accessories" for installation of roof curbs.
- C. Install units with clearances for service and maintenance.

- D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."
- E. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- F. Install ducts adjacent to power ventilators to allow service and maintenance.
- G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Verify that shipping, blocking, and bracing is removed.
 - 2. Verify that unit is secure on mountings and supporting devices and connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan-drive system, align and adjust belts, and install belt guards.
 - 5. Adjust belt tension.
 - 6. Adjust damper linkages for proper damper operation.
 - 7. Verify lubrication for bearings and other moving parts.
 - 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 - 10. Shut unit down and reconnect automatic temperature-control operators.
 - 11. Remove and replace malfunctioning units and retest as specified above.
- B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 233423

SECTION 233813 - COMMERCIAL-KITCHEN HOODS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes Type I and Type II commercial kitchen hoods.

1.2 SUBMITTALS

- A. Product Data, SD-H14A: For the following:
 - 1. Filters/baffles.
 - 2. Fire-suppression systems.
 - 3. Lighting fixtures.
- B. Shop Drawings, SD-H17B: Signed and sealed by a qualified professional engineer.
 - 1. Show plan view, elevation view, sections, roughing-in dimensions, service requirements, duct connection sizes, and attachments to other work.
 - 2. Show cooking equipment plan and elevation to confirm minimum code-required overhang.
 - 3. Indicate performance, exhaust and makeup air airflow, and pressure loss at actual Project-site elevation.
 - 4. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 5. Design Calculations: Calculate requirements for selecting seismic restraints.
 - 6. Wiring Diagrams: Power, signal, and control wiring.
 - 7. Piping Diagrams: Detail fire-suppression piping and components and differentiate between manufacturer-installed and field-installed piping. Show cooking equipment plan and elevation to illustrate fire-suppression nozzle locations.

1.3 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D 1.1M, "Structural Welding Code - Steel," for hangers and supports; and AWS D9.1/D9.1M, "Sheet Metal Welding Code," for joint and seam welding.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 HOOD MATERIALS

- A. Stainless-Steel Sheet: ASTM A 666, Type 304.
 - 1. Minimum Thickness: 0.037 inch.
 - 2. Finish: Comply with SSINA's "Finishes for Stainless Steel" for recommendations for applying and designating finishes.
 - a. Finish shall be free from tool and die marks and stretch lines and shall have uniform, directionally textured, polished finish indicated, free of cross scratches. Grain shall run with long dimension of each piece.
 - 3. Concealed Stainless-Steel Surfaces: ASTM A 480/A 480M, No. 2B finish (bright, cold-rolled, unpolished finish).
 - 4. Exposed Surfaces: ASTM A 480/A 480M, No. 4 finish (directional satin).
 - 5. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Zinc-Coated Steel Shapes: ASTM A 36/A 36M, zinc coated according to ASTM A 123/A 123M requirements.
- C. Sealant: ASTM C 920; Type S, Grade NS, Class 25, Use NT. Elastomeric sealant shall be NSF certified for commercial kitchen hood application. Sealants, when cured and washed, shall comply with requirements in 21 CFR, Section 177.2600, for use in areas that come in contact with food.
 - 1. Color: See architectural drawings and spec for sealant color.
 - 2. Backer Rod: Closed-cell polyethylene, in diameter larger than joint width.
- D. Gaskets: NSF certified for end-use application indicated; of resilient rubber, neoprene, or PVC that is nontoxic, stable, odorless, nonabsorbent, and unaffected by exposure to foods and cleaning compounds, and that passes testing according to UL 710.

2.2 GENERAL HOOD FABRICATION REQUIREMENTS

- A. Welding: Use welding rod of same composition as metal being welded. Use methods that minimize distortion and develop strength and corrosion resistance of base metal. Make ductile welds free of mechanical imperfections such as gas holes, pits, or cracks.
 - 1. Welded Butt Joints: Full-penetration welds for full-joint length. Make joints flat, continuous, and homogenous with sheet metal without relying on straps under seams, filling in with solder, or spot welding.
 - 2. Grind exposed welded joints flush with adjoining material and polish to match adjoining surfaces.
 - 3. Where fasteners are welded to underside of equipment, finish reverse side of weld smooth and flush.
 - 4. Coat concealed stainless-steel welded joints with metallic-based paint to prevent corrosion.

- B. For metal butt joints, comply with SMACNA's "Kitchen Equipment Fabrication Guidelines."
- C. Form metal with break bends that are not flaky, scaly, or cracked in appearance; where breaks mar uniform surface appearance of material, remove marks by grinding, polishing, and finishing.
- D. Sheared Metal Edges: Finish free of burrs, fins, and irregular projections.
- E. In food zones, as defined in NSF, fabricate surfaces free from exposed fasteners.
- F. Cap exposed fastener threads, including those inside cabinets, with stainless-steel lock washers and stainless-steel cap (acorn) nuts.
- G. Fabricate pipe slots on equipment with turned-up edges sized to accommodate service and utility lines and mechanical connections.
- H. Fabricate enclosures, including panels, housings, and skirts, to conceal service lines, operating components, and mechanical and electrical devices including those inside cabinets, unless otherwise indicated.
- I. Fabricate seismic restraints according to SMACNA's "Kitchen Equipment Fabrication Guidelines," Appendix 1, "Guidelines for Seismic Restraints of Kitchen Equipment."
- J. Fabricate equipment edges and backsplashes according to SMACNA's "Kitchen Equipment Fabrication Guidelines."
- K. Fabricate enclosure panels to ceiling and wall as follows:
 - 1. Fabricate panels on all exposed side(s) with same material as hood, and extend from ceiling to top of hood canopy and from canopy to wall.
 - 2. Wall Offset Spacer: Minimum of 3 inches.

2.3 TYPE I EXHAUST HOOD FABRICATION

- A. Manufacturers: Provide products by the following:
 - 1. Greenheck
 - 2. Captive-Aire Systems.
- B. Weld all joints exposed to grease with continuous welds, and make filters/baffles or grease extractors and makeup air diffusers easily accessible for cleaning.
 - 1. Fabricate hoods according to NSF 2, "Food Equipment."
 - 2. Hoods shall be listed and labeled, according to UL 710, by a testing agency acceptable to authorities having jurisdiction.
 - 3. Hoods shall be designed, fabricated, and installed according to NFPA 96.
 - 4. Include access panels as required for access to fire dampers and fusible links.
 - 5. Duct Collars Without Fire Dampers: Minimum 0.0598-inch-thick steel at least 3 inches long, continuously welded to top of hood and at corners. Fabricate a collar with a 0.5-inch-wide duct flange.

- C. Hood Configuration: Exhaust with makeup air supply grille
- D. Hood Styles: Wall-mounted canopy.
- E. Filters/Baffles: Removable, aluminum, with spring-loaded fastening. Fabricate stainless steel for filter frame and removable collection cup and pitched trough. Exposed surfaces shall be pitched to drain to collection cup. Filters/baffles shall be tested according to UL 1046, "Grease Filters for Exhaust Ducts," by an NRTL acceptable to authorities having jurisdiction.
- F. Lighting Fixtures: Surface-mounted, compact fluorescent fixtures and lamps with lenses sealed vaportight. Wiring shall be installed in conduit on hood exterior. Number and location of fixtures shall provide a minimum of 70 fc at 30 inches above finished floor.
 - 1. Light switches shall be mounted in hood control panel.
 - 2. Lighting Fixtures: Incandescent complying with UL 1598.
- G. Hood Controls: Wall-mounting control cabinet, fabricated of stainless steel.
 - 1. Exhaust Fan/Makeup Air: On-off switches shall start and stop the fans. Interlock exhaust fan with fire-suppression system to operate fan(s) during fire-suppression-agent release and to remain in operation until manually stopped. Include red pilot light to indicate fan operation. Motor starters shall comply with Division 26 Section "Enclosed Controllers."
 - 2. High-Temperature Control: Alarm shall sound and cooking equipment shall shut down before hood discharge temperature rises to actuation temperature of fire-suppression system.
- H. Capacities and Characteristics:
 - 1. As scheduled.

2.4 WET-CHEMICAL FIRE-SUPPRESSION SYSTEM

- A. Manufacturers: Provide products by the following:
 - 1. Ansul Incorporated; a Tyco International Ltd. Company.
- B. Description: Engineered distribution piping designed for automatic detection and release or manual release of fire-suppression agent by hood operator. Fire-suppression system shall be listed and labeled for complying with NFPA 17A, "Wet Chemical Extinguishing Systems," by a qualified testing agency acceptable to authorities having jurisdiction.
 - 1. Steel Pipe, NPS 2 and Smaller: ASTM A 53/A 53M, Type S, Grade A, Schedule 40, plain ends.
 - 2. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300.
 - 3. Piping, fusible links and release mechanism, tank containing the suppression agent, and controls shall be factory installed. Controls shall be in stainless-steel control cabinet mounted on hood on the wall, in the location indicated. Furnish manual pull station for wall mounting, in the location indicated. Exposed piping shall be covered with chrome-plated aluminum tubing. Exposed fittings shall be chrome plated.
 - 4. Liquid Extinguishing Agent: Noncorrosive, low-pH liquid.

5. Furnish micro-switches to activate shunt trip breakers or de-energize electrical contactors for electric fueled appliances
6. Fire-suppression system controls shall be integrated with controls for fans, lights, and fuel supply and located in a single cabinet for each group of hoods immediately adjacent.
7. Wiring shall have color-coded, numbered terminal blocks and grounding bar. Spare terminals for fire alarm, optional wiring to start fan with fire alarm, red pilot light to indicate fan operation, and control switches shall all be factory wired in control cabinet with relays or starters. Include spare terminals for fire alarm, and wiring to start fan with fire alarm.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Complete field assembly of hoods where required.
 1. Make closed butt and contact joints that do not require filler.
 2. Grind field welds on stainless-steel equipment smooth, and polish to match adjacent finish. Comply with welding requirements in Part 2 "General Hood Fabrication Requirements" Article.
- B. Install hoods and associated services with clearances and access for maintaining, cleaning, and servicing hoods, filters/baffles, grease extractor, and fire-suppression systems according to manufacturer's written instructions and requirements of authorities having jurisdiction.
- C. Make cutouts in hoods where required to run service lines and to make final connections, and seal openings according to UL 1978.
- D. Securely anchor and attach items and accessories to walls, floors, or bases with stainless-steel fasteners, unless otherwise indicated.
- E. Install hoods to operate free from vibration.
- F. Install trim strips and similar items requiring fasteners in a bed of sealant. Fasten with stainless-steel fasteners at 48 inches o.c. maximum.
- G. Install sealant in joints between equipment and abutting surfaces with continuous joint backing, unless otherwise indicated. Provide airtight, watertight, vermin-proof, sanitary joints.
- H. Install lamps, with maximum recommended wattage, in equipment with integral lighting.
- I. Set initial temperatures, and calibrate sensors.
- J. Set field-adjustable switches.
- K. Connect ducts according to requirements in Division 23 Section "Air Duct Accessories." Install flexible connectors on makeup air supply duct. Weld exhaust-duct connections with continuous liquidtight joint.
- L. Install fire-suppression piping for remote-mounted suppression systems according to NFPA 17A, "Wet Chemical Extinguishing Systems."

3.2 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Test each equipment item for proper operation. Repair or replace equipment that is defective, including units that operate below required capacity or that operate with excessive noise or vibration.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 3. Perform hood performance tests required by authorities having jurisdiction.
 - 4. Perform fire-suppression system performance tests required by authorities having jurisdiction.
- D. Prepare test and inspection reports.

END OF SECTION 233813

SECTION 260400 – ELECTRICAL WORK SUMMARY

PART 1 – GENERAL

1.1 SUMMARY

A. Electrical Work can be generally summarized (but not necessarily limited to) to the work described in this Section and other sections of Division 26.

1. Provide and install all equipment fixtures and materials as required to accomplish the scope of work.
2. Contractor shall verify field conditions prior to bidding. Prices quoted shall include all equipment, fixtures, material, labor, fees, permits and incidental expenses. No additional bills shall be submitted, except for approved change orders.
3. All work must conform to the latest National Electrical Code, Utility, State and Local regulations.
4. All work must conform to Drawings and Specifications provided.
5. All wiring shall be copper, except where specifically allowed on Drawings. Every feeder and branch circuit shall have a dedicated equipment grounding conductor.
6. All wiring shall be concealed in walls, except where specifically allowed on Drawings.
7. All wiring shall be run in conduits (or surface raceway and under floor duct, where indicated on Drawings). Type AC & MC cables and flexible conduits allowed only for branch circuits in concealed spaces to connect fixtures and equipment. Type NM, NMS, NMC not allowed.
8. Emergency feeders and branch circuits including lighting, shall be run in dedicated conduits, separate from normal power.
9. Rough-in and make final connections to Owner furnished/Contractor installed equipment.
10. Rough-in and make final connections to Owner furnished/Owner installed equipment.
11. Coordinate final location of boxes, equipment and fixtures with Owner.
12. Submit itemized bid for scope of work showing unit prices and total quantities.

B. Work in the electrical contract includes, but is not limited to, the following:

1. HVAC, Plumbing and Refrigeration Equipment:

Work done by others:

- a. Control equipment and equipment safety disconnect switches integral to equipment.

Work by Electrical Contractor:

- a. Provide conduits and wiring for equipment power and control, 50 volts and above, devices, including disconnects not integral to equipment. Note: 24 volt automatic temperature control wiring by controls contractor)
- a. Note that electrical power can be run to equipment on the roof using gas/refrigeration supports.

2. Telephone System:

Work done by others:

- a. Equipment, wiring and outlets.

Work by Electrical Contractor:

- b. Provide and install conduit system and boxes for units indicated on the drawings. Each conduit run shall have "pull" string.
 3. Fire and Security Systems:

Work done by Electrical Contractor:
 - a. Equipment, wiring and devices.
 4. Other Alarm and Communication Systems: **NOT FIRE AND SECURITY SYSTEMS**

Work done by others:
 - a. Equipment, wiring and outlets.
Work done by Electrical Contractor:
 - a. Provide and install conduit system boxes and power for units indicated on drawings. Each conduit run shall have "pull" string.
- C. Temporary facilities and controls in the Electrical Contract include, but are not limited to, the following:
1. Furnish, install and remove the temporary electrical power and lighting systems and pay for all labor, materials and equipment required therefore. All such temporary electrical work shall meet the requirements of the National Electrical Code, of the local utility company, and OSHA.
 2. Make all necessary arrangements with the local utility company as to where the temporary electric service can be obtained.
 3. Secure and pay for all required permits, certificates, notarizations, back charges for work performed by others, and other expenses incidental to the installation of the temporary electric service.
 4. Provide a temporary 120/208V, 3 phase, 4 wire service to the building as required to provide electric light and power while the building is under construction and until the permanent feeders have been installed and tested. Install and maintain a feeder or feeders of sufficient capacity for the requirements of each floor.

The temporary electric service shall be based on the following:
 - a. Rooms or spaces under 250 sq. ft. - one (1) 100 watt lamp.
 - b. Rooms or spaces over 250 sq. ft. and under 500 sq. ft - two (2) 100 watt lamps.
 - a. Rooms or spaces over 500 sq. ft. - one (1) 200 watt lamp per every 1,000 sq. ft. or fraction thereof.
 5. Sufficient wiring outlets and lamps shall be installed to insure proper lighting in stairwells, corridors and passage areas.
 6. Temporary power, in addition to the lighting requirements, shall be provided throughout the building for electrically operated tools on a minimum of 0.50 watts per sq. ft. Motors up to and including one hp only shall be provided for.
 7. Outlets shall be located at convenient points so that extension cords of not over 50 ft. in length will reach all work requiring light or power.
 8. Temporary electric service shall be provided for the offices of the Contractor and Hannaford Bros. Co. Construction Project Manager, until such time as the removal of these offices is ordered by Hannaford Bros. Co.

9. Electric service for electric welders is not to be provided, except as reimbursable item as covered below.
10. Installation
 - a. Provide and have installed all necessary overhead pole lines, transformers, meters, cables, panelboards, switches and accessories required by the temporary light and power installation.
 - b. Furnish and install all extension cords, lamps, sockets, motors, and accessories as required for their work.
 - Any temporary wiring of a special nature, other than that specified above, required for their work.
 - Any temporary wiring of construction offices and buildings used by them, other than the office of Hannaford Bros. Co.
 - All temporary wiring, service equipment, and accessories there to shall be removed when directed to.
 - c. All lamps installed in permanent lighting fixtures and used as temporary lights during the construction periods, shall be removed and replaced before completion by the set of lamps required to be furnished and installed under the Contract.

END OF SECTION 260400

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceways and cables.
 - 2. Sleeve seals.
 - 3. Grout.
 - 4. Common electrical installation requirements.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Manufacturers: Provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. Metraflex Co.
 - c. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 3. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, non-corrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways or cables penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs.
- C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- D. Cut sleeves to length for mounting flush with both surfaces of walls.
- E. Extend sleeves installed in floors 2 inches above finished floor level.
- F. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- G. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
- I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

- J. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

3.3 SLEEVE-SEAL INSTALLATION

- A. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.2 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. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors only: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types: XHHN, THHW, THWN (75°C) for 100 amps or higher; XHHN, THHN (90°C) for less than 100 amps
- C. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, Type AC, metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller (not smaller than No. 12 AWG for branch circuits & not smaller than No. 16 AWG for control circuits); stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type XHHN, THHN-THWN, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type XHHN, THHN-THWN, single conductors in raceway, Armored cable, Type AC, or Metal-clad cable, Type MC.
- C. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway, Armored cable, Type AC, Metal-clad cable, Type MC.
- E. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- G. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- H. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

- G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.
- H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.3 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. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.

- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
 - 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more. Bond conductor to each unit and to air duct and connected metallic piping.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

- C. Grounding and Bonding for Piping:
 - 1. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans. Install bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Test completed grounding system at each location where a maximum ground-resistance level is specified.
 - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
- B. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
- C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Hangers and supports for electrical equipment and systems.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Provide products by one of the following:
 - a. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. ERICO International Corporation.
 - c. Thomas & Betts Corporation.
 - d. Unistrut; Tyco International, Ltd.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 5. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Provide products by one of the following:
 - i Cooper B-Line, Inc.; a division of Cooper Industries.
 - ii Hilti Inc.
 - iii ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - iiii MKT Fastening, LLC.
 2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
 5. Toggle Bolts: All-steel springhead type.
 6. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To New Concrete: Bolt to concrete inserts.
 - 2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units
 - 3. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 Spring-tension clamps.
 - 4. To Light Steel: Sheet metal screws.
 - 5. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 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. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. EMT: ANSI C80.3.
- D. FMC: Zinc-coated steel.
- E. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 - 2. Fittings for EMT: Steel compression type.
 - 3. Flexible and Liquidtight Fittings: Termination of raceways in cabinets, boxes and equipment enclosures shall be made with insulated bushings.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. ENT: NEMA TC 13.
- B. LFNC: UL 1660.
- C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.
- C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
 - 1. Ground flange, neoprene gasket
 - 2. Cover: Stainless steel with stainless steel screws
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- F. Cabinets:
 - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit or IMC.
 - 2. Concealed Conduit, Aboveground: Rigid steel conduit, IMC or EMT.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
 - 6. Conduits on the roof, power and BAS LON loop, shall be installed and closed off to prevent water or other forms of precipitation entering the systems. Do not leave conduit bodies or pipe open to weather at anytime during the installation.
- B. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.

3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit or IMC. Includes raceways in the following locations:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit or IMC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 3R in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
 1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

- I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- K. Raceways for Communications Cable: Install as follows:
 - 1. 3/4-Inch (19-mm) Trade Size: Install raceways in maximum lengths of 50 feet (15 m).
 - 2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
 - 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- L. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- M. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- N. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of power and control cables.
 - 3. Identification for conductors.
 - 4. Equipment identification labels.
 - 5. Miscellaneous identification products.

1.2 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. 480V: Blue indicating voltage/phase
 - 2. 208V: Black indicating voltage/phase
 - 3. Fire Alarm: Red
 - 4. Motor or other control systems: Green
 - 5. Telephone System: Yellow
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.2 ARMORED AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Same as described under Raceways above.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.4 FLOOR MARKING TAPE

- A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.6 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.7 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/8 inch (3.2 mm) high letters for individual switches and loads served. Minimum 1/ inch (6.4 mm) high letters for distribution and control equipment.
 - 1. Engraved lamacoid with white letters on black background.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Describe panel name, voltage, phase & amps.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- E. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Feeder and Branch Circuits More Than 60A, and 120V to ground: Install labels at 25 foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - 1. Emergency Power.
 - 2. Power.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
 - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - i Phase A: Black.

- ii Phase B: Red.
 - iii Phase C: Blue.
 - iiii Neutral: White.
 - c. Colors for 480/277-V Circuits:
 - i Phase A: Brown.
 - ii Phase B: Orange.
 - iii Phase C: Yellow.
 - iiii. Neutral: Gray.
 - d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- E. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
 - 1. Comply with 29 CFR 1910.145.
 - 2. Identify system voltage with black letters on an orange background.
 - 3. Apply to exterior of door, cover, or other access.
- G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: As described above
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label 4 inches (100 mm) high.

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- c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
- d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Indoor vacancy sensors.
- B. See Division 26 Section "Panelboards" for programmable circuit breaker lighting control.
- C. See Division 26 Section "Wiring Devices" for manual light switches.

1.2 SUBMITTALS

- A. Product Data, SD-E10: For each type of product indicated.

1.3 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.

PART 2 - PRODUCTS

2.2 INDOOR VACANCY SENSORS

- A. Manufacturers: Provide products by one of the following:
 - 1. Hubbell Lighting.
 - 2. Leviton Mfg. Company Inc.
 - 3. Watt Stopper (The).
- B. General Description: Wall switch, dual technology type, 120/277 volt, 180 degree field of view, with a minimum coverage area of 900 square feet.
 - 1. Operation: Unless otherwise indicated, manually turn lights on and automatically turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 5 minutes to 30 minutes.
 - 2. Automatic Light Level Sensor: Adjustable from 8 footcandles to 180 footcandles; keep lighting off when selected lighting level is present.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 - 1. Identify controlled circuits in existing lighting contactors.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes lighting and appliance branch-circuit panelboards.
- B. Related Sections:
 - 1. Section 260553, "Identification for Electrical Systems"

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Flush- and surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- B. Incoming Mains Location: Top.
- C. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus Configured Terminators: Mechanical type.

- E. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Provide products by one of the following:
 - 1. Square D, only, no others permitted.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker or lugs only, as indicated on the panel schedule.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407.
- B. Mount top of trim six (6) feet above finished floor unless otherwise indicated.
- C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- D. Install overcurrent protective devices and controllers not already factory installed.
- E. Install filler plates in unused spaces.
- F. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- G. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads and incorporating Owner's panelboard schedule designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
 - 1. Refrigeration system numbers shall be used to identify circuits in the directories. Refrigeration system numbers identify each case and walk-in box and are indicated on the drawings.

2. Panelboard directories shall not be laminated, allowing for additional circuit identification, in the future, to the directory.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Wall-switch.

1.2 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. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Provide products by one of the following:
 - 1. Arrow-Hart.
 - 2. Hubbell.
 - 3. General Electric.
 - 4. Pass & Seymour/Legrand.
 - 5. Eagle

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Color: Ivory

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Color: Ivory

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 20 A:
 - 1. Color: Ivory
- C. Pilot Light Switches, 20 A:
 - 1. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."
 - 2. Color: Ivory

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant die-cast aluminum with hinged, lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.

2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new, and retest as specified above.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Cartridge fuses rated 600-V ac and less for use in enclosed switches.

1.2 SUBMITTALS

- A. Product Data, SD-E16: For each type of product indicated, include time current curves.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA FU 1 for cartridge fuses.
- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following manufacturers:
 - 1. Cooper Bussmann, Inc.
 - 2. Edison Fuse, Inc.
 - 3. Ferraz Shawmut, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

- A. Motor Branch Circuits: Class RK1, time delay.
- B. Other Branch Circuits: Class RK1, time delay.

3.2 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.3 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Enclosures.
- B. Related Sections:
 - 1. Section 260553, "Identification for Electrical Systems".

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70, "National Electrical Code".
- C. Comply with NFPA 70E, "Electrical Safety in the Workplace".

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Square D; a brand of Schneider Electric.
- B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Suitable for number, size, and conductor material.

2.2 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

B. Install fuses in fusible devices.

C. Comply with NECA 1.

3.2 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch, component, connecting supply, and feeder.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

- D. Enclosed switches will be considered defective if they do not pass tests and inspections.

END OF SECTION 262816

SECTION 265100 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures, lamps, and ballasts.
 - 2. Lighting fixture supports.
- B. See Division 26 Section "Lighting Control Devices" for automatic control of lighting, including vacancy sensors.

1.2 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. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In Lighting Fixture Schedule where titles below are column or row headings that introduce lists, the following requirements apply to product selection:
 - 1. Manufacturers: Provide products by the manufacturer indicated in the Lighting Fixture Schedule.

2.2 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- C. Metal Parts: Free of burrs and sharp corners and edges.
- D. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

- E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit re-lamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during re-lamping and when secured in operating position.
- F. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
- G. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.10 inch minimum unless different thickness is indicated.
 - b. UV stabilized.
- H. LED track head and track: U.L. listed track and track head. Enamel coated or powder coated steel or aluminum gimbel ring type lampholder with steel yoke finished to match gimbel. Yoke shall allow rotation up to 330°. Track head shall pivot up to 90° from vertical (nadir). Track head adapter shall be injection molded plastic compatible with track type. Adapter shall snap lock to secure track head to the track. Lampholder shall be medium base porcelain socket with injection molded plastic cover.
 - 1. Track shall be U.L. listed, extruded aluminum channel, enamel coated or powder coated. Copper conductors shall have PVC insulators and shall be co-extruded with track. Track shall have visible indication of polarity for proper electrical connection and mechanical alignment where multiple sections are joined. Provide accessories required by installation for power feed, connector configurations for multiple sections, dead ends, outlet box covers, mounting hardware and track reinforcement.
 - 2. Track and track finish color shall be as indicated on the drawings.

2.3 BALLASTS

- A. High efficiency electronic Ballasts for Linear Fluorescent Lamps: Comply with ANSI C82.11; instant-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output.
 - 1. Sound Rating: A.
 - 2. Total Harmonic Distortion Rating: Less than 10 percent.
 - 3. Transient Voltage Protection: IEEE C62.41, Category A or better.
 - 4. Operating Frequency: 20 kHz or higher.
 - 5. Lamp Current Crest Factor: 1.7 or less.
 - 6. Ballast Factor as follows:
 - a. Normal ballast factor, 0.88 or higher, for fixtures in or on ceilings below 10 feet.
Osram Quicktronic QHE_X32T8/UNIV ISN-SC
 - 7. Power Factor: 0.95 or higher.

8. Number of ballasts per fixture: Two, three or four lamp ballasts; single lamp ballasts are not permitted.
- B. Ballasts for fixtures switched with motion sensors or occupancy sensors shall be programmed start, high efficiency.
1. Sound Rating: A.
 2. Total Harmonic Distortion Rating: Less than 10 percent.
 3. Transient Voltage Protection: IEEE C62.41, Category A or better.
 4. Operating Frequency: 20 kHz or higher.
 5. Ballast factor shall be 0.88 or higher. Osram Quicktronic QTP_X32T8/UNIV PSN_C
 6. Power Factor: 0.95 or higher.
 7. Number of ballasts per fixture: Two, three or four lamp ballasts; single lamp ballasts are not permitted.
- C. Ballasts for Temperatures 0 Deg F and Higher for Linear Fluorescent Lamps: Electronic type designed for use with indicated lamp types.

2.4 LED FIXTURES

- A. Rated life of 60,000 hours at 70% lumen output.
- B. Integral driver.
- C. Nominal Operating Voltage: 277 V ac.
- D. Track heads:
 1. Produce and Floral Departments: Rated 38W nominal, 1950 lumens (minimum), CRI 85, color temperature 2700 K.

2.5 LAMPS

- A. Low-Mercury Fluorescent Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- B. T8 Instant-Start low-mercury Fluorescent Lamps: Rated 32 W maximum, nominal length 48 inches, 2800 initial lumens (minimum), CRI 78 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.
 1. Osram/Sylvania Octron XPS FO32/835/XPS/ECO or GE Starcoat HL F32T8/XL/SPX35/HL/ECO.
 2. Provide lamps, where indicate, with plastic tube guards to protect against lamp shatter.
- C. LED (Light Emitting Diode) Lamps: UL listed; PAR 38; engineered specular faceted reflector; 25 degree beam angle; cast aluminum heat sin; integral 110-120VAC driver; color temperature 2700 Kelvin; color rendition index 82 to 85; E26 screw base.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Wires, for acoustic or gypsum wallboard ceiling applications: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Wires for exposed applications: "Aircraft cable", type 302 stainless steel 0.125 inch (3.175 mm) diameter; breaking strength 1700 pounds.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Comply with NFPA 70 for minimum fixture supports.
- C. Suspended Lighting Fixture Support:
 - 1. Wire suitable for the application.
 - 2. Chain, where provided with the fixture.
- D. Adjust aimable lighting fixtures to provide required light intensities.
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt normal power supply to demonstrate proper operation. Verify transfer from normal power to emergency power and retransfer to normal.

END OF SECTION 265100