## CAPITAL CITY DEVELOPMENT CORPORATION

#### BOISE, IDAHO

# BIDDING REQUIREMENTS AND CONTRACT DOCUMENTS

for the construction of the

# CCDC PARKING CAPITOL/MYRTLE GARAGE ELEVATOR #4 MODERNIZATION

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JACOBS

#### Boise, Idaho

February 2024

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Project No. D35899A2

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# SECTION 00 01 07 SEALS PAGE

#### **SPECIFICATIONS**

DIVISION 07 – THERMAL AND MOISTURE PROTECTION DIVISION 08 – OPENINGS DIVISION 09 – FINISHES DIVISION 14 – CONVEYING EQUIPMENT



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# **END OF SECTION**

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# PART 1

# **SPECIFICATIONS**

# SECTION 07 92 00 JOINT SEALANTS

# PART 1 GENERAL

# 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. ASTM International (ASTM):
    - a. C661, Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
    - b. C834, Standard Specification for Latex Sealants.
    - c. C920, Standard Specification for Elastomeric Joint Sealants.
    - d. C1193, Standard Guide for Use of Joint Sealants.

# 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Shop Drawings: Surface preparation instructions. Indicate where each product is proposed to be used.
  - 2. Samples: Material proposed for use showing color range available.
- B. Informational Submittals:
  - 1. Installation instructions.
  - 2. Documentation showing applicator qualifications.
  - 3. Manufacturer's Certificate of Compliance.
  - 4. Special guarantee.

# 1.03 QUALITY ASSURANCE

A. Applicator Qualifications: Minimum of 5 years' experience installing sealants in projects of similar scope.

# 1.04 ENVIRONMENTAL REQUIREMENTS

A. Ambient Temperature: Between 40 degrees F and 80 degrees F (4 degrees C and 27 degrees C) when sealant is applied. Consult manufacturer when sealant cannot be applied within these temperature ranges.

#### 1.05 SPECIAL GUARANTEE

A. Product: Furnish manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall

provide for correction or, at the option of the Owner, removal and replacement of Work specified in this section found defective during a period of 5 years after the date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work shall be as specified in the General Conditions.

- B. Conditions: No adhesive or cohesive failure of sealant.
- C. Sealed Joints: Watertight and weathertight with normal usage.

# PART 2 PRODUCTS

# 2.01 SEALANT MATERIALS

- A. Characteristics:
  - 1. Uniform, homogeneous.
  - 2. Free from lumps, skins, and coarse particles when mixed.
  - 3. Nonstaining, nonbleeding.
  - 4. Hardness of 15 minimum and 50 maximum, measured by ASTM C661 method.
  - 5. Immersible may be substituted for non-immersible.
- B. Color: As selected by Engineer.

Joint Size	Sealant Type
Less than 1"	3, 4,

# 2.02 PREPARATION

- A. Verify that joint dimensions, and physical and environmental conditions, are acceptable to receive sealant.
- B. Surfaces to be sealed shall be clean, dry, sound, and free of dust, loose mortar, oil, and other foreign materials.
  - 1. Mask adjacent surfaces where necessary to maintain neat edge.
  - 2. Starting of Work will be construed as acceptance of subsurfaces.
  - 3. Apply primer to dry surfaces as recommended by sealant manufacturer.
- C. Verify joint shaping materials and release tapes are compatible with sealant.
- D. Examine joint dimensions and size materials to achieve required width/depth ratios.
- E. Follow manufacturer's instructions for mixing multi-component products.

JOINT SEALANTS 07 92 00 - 2 PW\JA\FED\D35899A2\30 FEBRAURY 2024 ©COPYRIGHT 2024 JACOBS

# 2.03 INSTALLATION

- A. Use joint filler to achieve required joint depths, to allow sealants to perform intended function.
  - 1. Install backup material as recommended by sealant manufacturer.
  - 2. Where possible, provide full length sections without splices; minimize number of splices.
- B. Use bond breaker where recommended by sealant manufacturer.
- C. Seal joints around door frames, expansion joints, control joints, and elsewhere as indicated.
- D. Joint Sealant Materials: Follow manufacturer's recommendation and instructions, filling joint completely from back to top, without voids.
- E. Joints: Tool slightly concave after sealant is installed.
  - 1. When tooling white or light color sealant, use a water wet tool.
  - 2. Finish joints free of air pockets, foreign embedded matter, ridges, and sags.

# 2.04 PREFORMED SEALS

- A. Prepare joint surfaces clean and dry, free from oil, rust, laitance, and other foreign material.
- B. Construct joints straight and parallel to each other and at proper width and depth.
- C. Apply joint sealant manufacturer's approved primer and adhesive in accordance with manufacturer's instructions.
- D. Install seal in accordance with manufacturer's instructions.

# 2.05 CLEANING

- A. Clean surfaces next to the sealed joints of smears or other soiling resultant of sealing application.
- B. Replace damaged surfaces resulting from joint sealing or cleaning activities.

# 2.06 JOINT SEALANT SCHEDULE

A. This schedule lists the sealant types acceptable for each joint location. Use as few different sealant types as possible to meet the requirements of Project.

Joint Locations	Sealant Type(s)
Expansion/Contraction and Control Joints At:	
Concrete Walls (except water-holding and belowgrade portions of structures)	1, 3, 4, 5, 6, 12
Concrete Floor Slabs (except for water-holding Structures)	2, 5
Concrete Walls and Slabs immersed in water and/or below grade	7
Slabs Subject to Vehicle and Pedestrian Traffic	2, 5
Masonry Walls	1, 3, 4, 5, 6, 7, 12, 13
Exterior Insulation and Finish System	4
Ceramic Tile Floors	1, 2, 5, 10
Ceramic Tile Walls	1, 3, 5, 10
Precast Concrete Wall Panels	3, 4, 5, 12, 13
Material Joints At:	
Metal Door, Window, and Louver Frames (Exterior)	1, 5, 6, 8, 12
Metal Door, Window, and Louver Frames (Interior)	1, 5, 6, 8, 9
Wall Penetrations (Exterior)	1, 5, 6, 8, 12
Wall Penetrations (Interior)	1, 5, 6, 8
Floor Penetrations	5, 6, 7
Ceiling Penetrations	1, 3, 4, 5, 6, 7
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Precast Concrete Wall Panels	1, 3, 4, 5, 6, 7, 12, 13
Glazed Concrete Masonry Unit Joints	1

Joint Locations	Sealant Type(s)
Precast/Prestressed Floor Panels (Interior)	2, 7
Precast/Prestressed Floor and Roof Panels (Exterior)	3, 7
Other Joints:	
Threshold Sealant Bed	5
Between Counter Tops and Backsplashes	10
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- B. Use sealant Type 5 for building joints.
- C. Use sealant Type 11 to seal voids and holes around penetrations through firerated elements.

# SECTION 08 06 01 DOOR AND HARDWARE SCHEDULE

# PART 1 GENERAL

#### 1.01 SUBMITTALS

A. Submittal requirements are specified in appropriate product sections.

# PART 2 PRODUCTS

#### 2.01 GENERAL

A. Products and materials referred to in this section are specified in the appropriate product sections.

# PART 3 EXECUTION

#### 3.01 GENERAL

A. Requirements for incorporation of scheduled products into the Work are specified in the appropriate product sections.

#### 3.02 SUPPLEMENTS

- A. The supplements listed below, following "End of Section," are a part of this specification.
  - 1. Door and Hardware Schedule: A tabulation of door, frame, and finish hardware characteristics for each opening numbered on Drawings. Provide items as scheduled.
  - 2. See Drawings for Door and Frame Types.

#### DOOR AND HARDWARE SCHEDULE

#### ABBREVIATIONS:

AL	Aluminum	MATL	Material
AS	As Selected	MET	Metal
CLSR	Closer	MS	Manufacturer's Standard
COL	Color	P-P	Push-Pull
CONSTR	Construction	RFS	Roll-Up Fire Shutter
FCTY	Factory	SC	Solid Core Wood
FNSH	Finish	SIM	Similar
FRP	Fiberglass Reinforced Plastic	SST	Stainless Steel
HC	Hollow Core	TSHD	Threshold
HM	Hollow Metal	VIN	Vinyl
KEY	Key Group	W-S	Weatherstripping
K-PL	Kick Plate	WW	Window Wall

#### NOTES:

- No. 1 See end of this Specification section for door and frame types.
- No. 2 For door details, see Drawing No. A102
- No. 3 Letter-number codes in hardware columns refer to items of hardware in Specification Section 08 71 00.
- No. 4 Numbers in "Fnsh" column refer to paint systems in Specification Section 09 90 05, Architectural Painting.
   No. 5 Codes in "COL" column refer to color list in Specification Section 09 90 05, Architectural Painting.
- No. 6 See Drawings for glass types.

Opening	5																										
	Size		Door Frame De			Details	lls Hardware								Fire Protection	Other											
No.	Width	Height	Constr	Туре	Glass	Fnsh	Col	Matl	Туре	Fnsh	Col	Head	Jamb	Sill	Hinge	Lock	Exit	Clsr	P-P	Stop	Bolt	K-PL	Tshd	W-S	Misc	Rating	Requirements
102	3'-0"	7'-0"	HM	А		P3	GRN	HM	А	P4	BLK	A102	A102		H2	L5						-				1.5hr	

# DOOR AND HARDWARE SCHEDULE 08 06 01 SUPPLEMENT - 1

# SECTION 08 11 00 METAL DOORS AND FRAMES

# PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. American National Standards Institute (ANSI):
    - a. A250.6, Hardware on Standard Steel Doors (Reinforcement Application).
    - b. A250.8, Recommended Specification for Standard Steel Doors and Frames.
    - c. A250.11, Recommended Erection Instructions for Steel Frames.
  - 2. ASTM International (ASTM):
    - a. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
    - b. A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
    - c. A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
    - d. A1008/A1008M, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
    - e. E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
  - 3. Builders Hardware Manufacturers Association (BHMA): A156.115, Hardware Preparations in Standard Steel Doors and Frames.
  - 4. National Fire Protection Association (NFPA): 80, Standard for Fire Doors and Other Opening Protectives.
  - 5. UL: Building Materials Directory.

# 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Applicable information for each type of door and frame, including:
    - a. Frame conditions and complete anchorage details, supplemented by suitable schedules covering doors and frames.
    - b. Relate to door numbers used in Contract Drawings.

PW\JA\FED\D35899A2\30 FEBRUARY 2024 ©COPYRIGHT 2024 JACOBS METAL DOORS AND FRAMES 08 11 00 - 1 B. Informational Submittals: Certificate of Compliance per test results or calculations) that assure items and its anchorages design criteria meets Common Product Requirements.

# 1.03 DELIVERY, STORAGE, AND HANDLING

- A. Properly identify each item with number used in Contract Drawings.
- B. Store doors upright, in protected dry area, at least 1-inch off ground or floor and at least 1/4-inch between individual pieces.

# PART 2 PRODUCTS

# 2.01 MANUFACTURERS

- A. Materials, equipment, and accessories specified in this section shall be products of:
  - 1. Curries Manufacturing.
  - 2. The Ceco Corp.
  - 3. Mesker Industries, Inc.
  - 4. Monarch Steelcraft, Ltd.
  - 5. Overly Manufacturing Co.
  - 6. Pioneer Industries.
  - 7. Steelcraft Manufacturing Co.
  - 8. Trussbilt, Inc.
  - 9. Stiles Custom Metal, Inc.

# 2.02 MATERIALS

- A. Basic Metal Material:
  - 1. ASTM A1008/A1008M; sheet steel, cold-rolled, stretcher level.
  - 2. ASTM A167, Type 316 stainless steel.
- B. Hollow Metal Frames:
  - 1. Products of hollow metal door manufacturer.
  - 2. ANSI 250.8, except as modified herein.
  - 3. Frames for Doors 16 gauge for knockdown or welded type, of crosssection shown.
  - 4. Prepare floor and wall anchors, reinforcement, and cutouts for hardware to meet requirements of BHMA A156.115 and ANSI A250.6.
  - 5. Finished size, shape, and profile of frame members as shown.

- 6. Concealed fasteners or welding are preferred to through-the-face fasteners.
- 7. Identification: Stamp opening number, as shown on Drawings, on center hinge reinforcement of each frame.
- C. Hollow Metal Doors: ANSI A250.8, except as modified herein. BHMA A156.115 and ANSI A250.6 to receive hardware specified in Door and Hardware Schedule.
  - 1. Interior:
    - a. Flush Panel Doors: 18 gauge, Level 2, Model 1.
    - b. Flush end closure at top of doors.
- D. Labeled Fire Doors and Frames:
  - 1. Conform to listing requirements of UL.
  - 2. Label each door and frame for class of rating required.
  - 3. Label requirements, dimensions, and type of door are indicated on Drawings.
    - a. Modify Drawing details if required to secure label.
    - b. Clearly identify modifications on Shop Drawings.

# 2.03 MISCELLANEOUS ITEMS

A. Furnish manufacturer's standard core filler, anchors, fasteners, and other ancillary items.

# 2.04 FACTORY FINISHING REQUIREMENTS

A. Phosphate treated metal for paint adhesion.

# PART 3 EXECUTION

- 3.01 INSTALLATION
  - A. Frames:
    - 1. Follow ANSI A250.11 and manufacturer's instructions.
      - a. Maintain scheduled dimensions, hold head level, and maintain jambs plumb and square.
      - b. Secure anchorages and connections to adjacent construction.
      - c. Wherever possible, leave frame spreader bars intact until frames are set perfectly square and plumb, and anchors are securely attached.

- B. Doors:
  - 1. Hollow Metal Doors: ANSI A250.8.
  - 2. Hardware: In accordance with manufacturer's templates and instructions.
    - a. Adjust operable parts for correct function.
    - b. Remove hardware, with exception of prime coated items, tag, box, and reinstall after finish paint work is completed.
  - 3. Labeled Doors: NFPA Pamphlet No. 80.

#### 3.02 FIELD PAINTING

- A. Where prime coat has been damaged, sand smooth and touch up with same primer as applied at shop.
  - 1. Remove rust before painting.
  - 2. Touch Up: Not obvious.
  - 3. Perform immediately after door and frame installation.

#### 3.03 PROTECTION

A. Protect installed doors and frames against damage from other construction Work.

#### 3.04 SCHEDULES

A. For tabulation of door and frame characteristics, such as size, type, detail, and finish hardware requirements, see Section 08 06 01, Door and Hardware Schedule.

# SECTION 08 71 00 DOOR HARDWARE

# PART 1 GENERAL

# 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. Builders Hardware Manufacturer's Association (BHMA):
    - a. A156.1, Butts and Hinges.
    - b. A156.2, Bored and Preassembled Locks and Latches.
    - c. A156.3, Exit Devices.
    - d. A156.4, Door Controls Closers.
    - e. A156.13, Mortise Locks & Latches.
    - f. A156.16, Auxiliary Hardware.
    - g. A156.18, Materials and Finishes.
  - 2. International Code Council (ICC): A117.1, Accessible and Usable Buildings and Facilities.
  - 3. UL: Fire Protection Equipment List.

# 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Shop Drawings:
    - a. Product Data: Manufacturer's literature for each item of finish hardware required herein, clearly marked.
    - b. Finish Hardware Schedule: Furnish complete and detailed schedule, show product items, numbers, and finishes for hardware for each separate opening.
    - c. Special Tools: Provide listing and description of usage.
- B. Informational Submittals:
  - 1. Operation and Maintenance Data.
  - 2. Manufacturer's Field Service Report.
  - 3. Certification of Hardware Consultant.
  - 4. Manufacturer's Certificate of Compliance, in accordance with Common Product Requirements.

# 1.03 QUALITY ASSURANCE

- A. Qualifications of Supplier: Recognized Supplier of architectural finish hardware, with warehousing facilities, who has been furnishing hardware in vicinity of Project for not less than 5 years, and who is, or who employs, architectural hardware consultant.
- B. Qualifications of Architectural Hardware Consultant (AHC): Certified by Door and Hardware Institute.

# 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Before delivery, clearly identify and tag each item of hardware with respect to specified description and location of installation.
- B. Provide secure storage for finish hardware until installation is made.

# 1.05 EXTRA MATERIALS

A. Special Tools: Two sets for installation and maintenance of hardware.

# PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Provide end products of one manufacturer for each product in order to achieve standardization for appearance, maintenance, and replacement.
- B. Finishes: BHMA A156.18.
- C. Some products listed below may not be used on this Project.

# 2.02 FASTENERS

A. Stainless steel.

# 2.03 BUTT HINGES

- A. BHMA A156.1.
- B. Quantity per Door Leaf (Minimum):

Door Height	Hinges					
Up to 5'-0"	1 pair					
5'-1" to 7'-7"	1-1/2 pair					

Door Height	Hinges
7'-8" to 10'-0"	2 pairs
10'-1" to 12'-6"	2-1/2 pairs

# C. Hinge Height (Minimum):

\_\_\_\_\_

Door Width	Hinge Height
Up to 3'-0"	4-1/2"
3'-1" to 4'-0"	5"
Over 4'-0"	6"

- D. Width: Minimum for clearance of trim and 180-degree swing.
- E. Exterior Hinges: Non-removeable pin.
- F. Joint Tolerance: 0.012 inch maximum, gauged in CLOSED position.
- G. Finish: Satin stainless steel No. 630.
- H. Types and Manufacturers:

No.	Type Description	Stanley	Mc-Kinney	Lawrence	BHMA
H1	Regular weight, two ball-races, full mortise, stainless steel	FBB191	TB2314	BB4101-1	A2112
H2	Plain bearing, full mortise, stainless steel	F191-32D	T2314	4181-32D	A2133
H3	Hinges or pivots furnished by door manufacturer				
H4	Extra heavy-weight, four ball races, full mortise, stainless steel	FBB199-32D	T4B3386	BB5151-A	A5111

No.	Type Description	Stanley	Mc-Kinney	Lawrence	BHMA
Н5	Heavyweight, four ball races, half mortise, stainless steel	FBB98	T4B3384	BB5651-32D	A5211
H6	Heavyweight, four ball races, half mortise, stainless steel	FBB113	T4B3382	BB9351-32D	A5411

# 2.04 LOCKS AND LATCH SETS

- A. Mortise Locks: BHMA A156.13, Series 1000, Grade 1.
  - 1. Materials: stainless steel.
  - 2. Trim: Wrought or forged lever handles and roses.
  - 3. Core Cylinders: Interchangeable, removable; minimum of six pins.
  - 4. Bolt Throw: 5/8-inch minimum.
  - 5. Lever Backset: 2-3/4 inches.
  - 6. Manufacturers and Products:
    - a. Sargent; LNJ.
    - b. Schlage; 03.
    - c. Best; 3H Fairbanks.
- B. Tactile Warning: Knurl knob backs and lever handles for touch identification; ICC A117.1, Section 4.29.3.
- C. Finish: Satin stainless steel No. 630.
- D. Locks and Latches: Match existing in manufacturer, design, finish, and keying. No substitutions allowed.
- E. Types and Manufacturers:

No.	Type Description	Best	Sargent	Schlage	BHMA
L1	Mortise entrance lock with lever handle	45H7TA3H	8245-LNJ	L9456P-03	F12, F13
L2	Bored, entrance lock	84K7AB4C	9G05	C53PD	F81, F82
L3	Mortise latch with lever handle	45H0N3H	8215-LNJ	L9010-03	F01
L4	Bored latch	84K0N4C	9U15	C10S	F75

No.	Type Description	Best	Sargent	Schlage	BHMA
L5	Mortise utility room lock with lever handle	45H7D3H	8204-LNJ	L9080-03	F07
L6	Bored, utility room lock	84K7D4C	9G04	C80PD	F86
L7	Deadlock	83T7K	15-475	B560	E2151
L8	Mortise privacy lock with lever handle	45H7L3H	8265-LNJ	L9040-03	F19, F22
L9	Bored, privacy lock	84K0L4C	9U65	C40S	F76
L10	Cabinet lock, drawer and door	3L7RD	1654	46-002	E07121
L11	Lock by door manufacturer; furnish cylinders for keying to other locks as required				
L12	Bored, exit only, lock	84K0Y4C	9G13	C12D	F89
L13	Padlock	61BRT	756HS	45-101	
L14	Fixed knob pull and roller; Latch: Ives 336, Stanley C44S	84K1DT4C	9U93	D170	
L15	Push-pull latch		115	Corbin 1860	
L16	Lock by exit device manufacturer; furnish cylinders for keying to other locks as required				

# F. Keying:

- 1. Lock Cylinders: Operate by grand master key system that allows for future expansion.
- 2. Keylocks: As directed by Owner.
- 3. Keys: Two per lock; tag with schedule information.
- 4. Master Keys: Four; send by registered mail to Owner.
- 5. Furnish lock manufacturer's removable core maximum security keying system.

#### 2.05 CONSTRUCTION KEY SYSTEM

- A. Removable construction core system for locks.
- B. See Article Manufacturer's Services under Part 3, Execution.

#### 2.06 CONSTRUCTION KEY SYSTEM

- A. Assemble permanent cylinders with construction inserts and ship with all lock sets.
- B. Change Keys: Pack in separately identified envelopes and ship.
- C. Construction Keys: Pack in cartons marked "packing list" and ship.
- D. Construction Insert Extractor Keys, Master Keys, and Grand Master Keys: Ship by registered mail to Owner.
- E. On completion of job, deliver construction keys to Owner.

#### 2.07 TEMPLATES

- A. Fabricate to template hardware applied to metal doors and frames.
- B. Ensure that required templates are furnished to various manufacturers for fabrication purposes.
- C. Templates: Make available not more than 10 days after receipt of approved Hardware Schedule.

#### 2.08 EXIT AND FIRE DOORS

- A. Exit Doors: Always openable from inside by simple turn of lever handle or push on panic bar without use of key or any special knowledge or effort, to include each leaf of door pairs.
- B. Hardware for Fire Doors: Underwriters Laboratories Inc., Fire Protection Equipment List.

# PART 3 EXECUTION

- 3.01 INSTALLATION
  - A. In accordance with manufacturer's written instructions.
  - B. Make Work neat and secure, develop full strength of components, and provide proper function.

DOOR HARDWARE 08 71 00 - 6

- C. Prevent marring, scratching, or otherwise damaging adjacent finishes during hardware installation.
- D. Latchbolts:
  - 1. Install to engage in strikes automatically, whether activated by closers or manually.
  - 2. In no case shall additional manual pressure be required to engage latchbolt in strike.
- E. Stops and Holders: Set to allow doors to open as far as possible.
- F. Wall Mounted Hardware: Install over solid structural backing or solid blocking in hollow walls.
- G. Thresholds:
  - 1. Cope ends neatly to profile of jamb.
  - 2. Set in sealant and seal ends to jambs.
- H. Key Control System Cabinet: Install where shown.
- I. Hardware: Adjust for easy, noise-free operation.
- J. Replace damaged hardware items.

# 3.02 MOUNTING DIMENSIONS

- A. Standard Door Hardware Locations: As recommended and published by Door and Hardware Institute, except as noted or detailed otherwise.
- B. Door Silencers: Install 3 inches from top and bottom of jamb and 1 inch above strike at single doors, and 3 inches from edges of doors in head for pairs of doors.

# 3.03 MANUFACTURER'S SERVICES

- A. Deliver permanent lock cores to Site.
- B. Remove temporary construction cores and insert permanent cores.
- C. Inspect each lock set to ensure permanent cores are operating satisfactorily.
- D. Deliver to Owner change and control keys for permanent system.

- E. Return temporary construction cores to manufacturer.
- F. Furnish manufacturer's representative for the following services at Site or classroom as designated by Owner, for minimum person-days listed below, travel time excluded: 1 person-days for installation assistance, inspection, and Manufacturer's Certificate of Proper Installation.

# 3.04 PROTECTION

- A. Cover and protect exposed surfaces of hardware during installation and until Substantial Completion.
- B. Fit, dismantle, and reinstall finish hardware as required for finish painting work.
- C. Protect and prevent staining of hardware during construction in accordance with manufacturer's recommendations.
- D. Remove protective measures and permanent lock cylinders installed prior to final cleaning.

# 3.05 DOOR AND HARDWARE SCHEDULE

- A. Door and Hardware Schedule in Section 08 06 01, Door and Hardware Schedule, is guide to functional requirements of each opening.
- B. Provide finish hardware as scheduled. Sizes omitted shall be as recommended by manufacturer.

# 3.06 HARDWARE SETS

HDW-1:	Item	Туре
	3 Pair butts	H1
	2 Exit devices (rim type) with cylinders for keying to other locks as required	
	1 Removable mullion	X1
	2 Closers	C2
	2 Floor stops and holders	S4
	2 Metal kickplates	K1
	1 Threshold	T1
	1 Set weatherstrip	W1

HDW-2:	Item	Туре
	1-1/2 Pair butts	H1
	1 Lock	L2
	1 Closer	C2
	1 Floor stop	S1
	1 Metal kickplate	K1
	1 Threshold	T1
	1 Set weatherstrip (narrow stop)	W2
HDW-3:	Item	Туре
	1-1/2 Pair butts	H1
	1 Lock	L1
	1 Closer	C2
	1 Floor stop and holder	S4
	1 Threshold	T1
	1 Set weatherstrip	W2
HDW-4:	Item	Туре
	1-1/2 Pair butts	H1
	1 Latch	L4
	1 Closer	C1
	1 Wall bumper	S2
	1 Plastic kickplate	K1
	1 Nameplate	M2
HDW-5:	Item	Туре
	1-1/2 Pair butts	H1
	1 Privacy lock	L9
	1 Closer	C1
	1 Wall bumper	S2
	1 Nameplate	N1

HDW-6:	Item	Туре
	1-1/2 Pair butts	H2
	1 Latch	L5
HDW-7:	Item	Туре
	1-1/2 Pair butts	H2
	1 Lock	L2
	1 Floor stop	S1
HDW-8:	Item	Туре
	3 Pair butts	H1
	1 Lock	L2
	2 Floor stop and holders	S4
	2 Flush bolts	B1
HDW-9:	Item	Туре
	4 Pair butts, stainless steel	H4
	1 Lock	L2
	2 Wall stop and holders	<b>S</b> 3
	1 - 8" Chain and foot-bolts	В3
	1 Threshold	T1
	1 Set weatherstrip	W1
HDW-10:	All hardware by door manufacturer except cylinder	

# SECTION 09 06 00 SCHEDULES FOR FINISHES

# PART 1 GENERAL

#### 1.01 SUBMITTALS

A. Submittal requirements are specified in appropriate product sections.

# PART 2 PRODUCTS

#### 2.01 GENERAL

A. Products and materials referred to in this section are specified in appropriate product sections.

# PART 3 EXECUTION

#### 3.01 INSTALLATION

A. Requirements for incorporation of scheduled products into the Work are specified in appropriate product sections.

#### 3.02 SUPPLEMENTS

- A. The supplements listed below, following "End of Section," are a part of this Specification.
  - 1. Interior Finish Schedule: A tabulation of surface materials, finishes, and colors for each interior space numbered on the Drawings.
  - 2. Exterior Finish Schedule: A tabulation of materials, finishes, and colors for each exterior space shown on the Drawings.
  - 3. Color List.
#### **INTERIOR FINISH SCHEDULE**

ABBRE	EVIATIONS:					NOTES:	
AC	Acoustical Ceiling	FCTY	Factory	QT	Quarry Tile	No. 1	Numbers in FNSH column refer to paint systems in Specification
ACFL	Access Flooring	FRP	Fiberglass Reinforced Plastic	RESIL	Resilient		Section 09 90 05.
ACMU	Acoustical CMU	FWC	Fabric Wall Covering	RRUB	Radial Rubber Flooring	No. 2	Codes in COL column refer to color list in this section.
ACT	Acoustical Tile	FNSH	Finish	RUB	Rubber Sheet Flooring	No. 3	Finish closets and alcoves the same as the space into which they
AL	Aluminum	GMU	Glass Masonry Unit	SMLS	Seamless Epoxy		open.
ARWB	Abuse Resistant Board	GCMU	Glazed Concrete Masonry	SOI	Spray-On Insulation	No. 4	Wall surfaces behind casework and other built-in items need not be
AS	As Selected	GWB	Gypsum Board	SVIN	Sheet Vinyl		painted or covered with wallcovering.
BRK	Brick	GSB	Gypsum Soffit Board	TCTG	Traffic Coating	No. 5	For exterior finishes and colors, see Specifications and elevation
CLR	Clear	GLZ	Glazing	VCT	Vinyl Composition Tile		drawings.
CMU	Concrete Masonry Units	HGT	Height	VINT	Vinyl Tile	No. 6	For door and frame finishes, see Door and Hardware Schedule in
COL	Color	HDNR	Clear Floor Hardener	VWC	Vinyl Wall Covering		Specification Section 08 06 01.
CONC	Concrete	MATL	Material	WD	Wood		
CNTR	Counter	MDO	Medium Density Overlay	WRB	Water Resistant GWB		
CPT	Carpet	MET	Metal	WW	Window Wall		
CRC	Chemical-Resistant Coatings	PLAM	Plastic Laminate	Х	Open		
CT	Ceramic Tile	PLAS	Plaster				
EIFS	Exterior Insulation and Finish	PAVT	Paver Tile				
System		PLWD	Plywood				
EXP	Exposed Structure	PNL	Paneling				
	-	PTN	Partition				

	Space		Floor				Base			Ty	pical Wa	մՈ		Other V	Wall			Ceili	ng			Miscella	neous		Other
No.	Name	Sub Fl	Fnsh	Col	Hgt	Matl	Fnsh	Col	Walls	Matl	Fnsh	Col	Wall	Matl	Fnsh	Col	Hgt	Matl	Fnsh	Col	Item	Matl	Fnsh	Col	<b>Req'ments</b>
101	ELEVATOR LOBBY	CONC	CONC	CLR	6"	RESIL	AS	BLA CK	ALL	GWB	COL	AS	ALL LOBB Y												
102																									
103																									

SCHEDULES FOR FINISHES 09 06 00 SUPPLEMENT - 1

#### **INTERIOR FINISH SCHEDULE** (EXAMPLE)

ABBR	EVIATIONS:					NOTES:	
AC	Acoustical Ceiling	FCTY	Factory	QT	Quarry Tile	No. 1	Numbers in FNSH column refer to paint systems in Specification
ACFL	Access Flooring	FRP	Fiberglass Reinforced Plastic	RESIL	Resilient		Section 09 90 0.
ACMU	Acoustical CMU	FWC	Fabric Wall Covering	RRUB	Radial Rubber Flooring	No. 2	Codes in COL column refer to color list in this section.
ACT	Acoustical Tile	FNSH	Finish	RUB	Rubber Sheet Flooring	No. 3	Finish closets and alcoves the same as the space into which they
AL	Aluminum	GMU	Glass Masonry Unit	SMLS	Seamless Epoxy		open.
ARWE	Abuse Resistant Board	GCMU	Glazed Concrete Masonry	SOI	Spray-On Insulation	No. 4	Wall surfaces behind casework and other built-in items need not be
AS	As Selected	GWB	Gypsum Board	SVIN	Sheet Vinyl		painted or covered with wallcovering.
BRK	Brick	GSB	Gypsum Soffit Board	TCTG	Traffic Coating	No. 5	For exterior finishes and colors, see Specifications and elevation
CLR	Clear	GLZ	Glazing	VCT	Vinyl Composition Tile		drawings.
CMU	Concrete Masonry Units	HGT	Height	VINT	Vinyl Tile	No. 6	For door and frame finishes, see Door and Hardware Schedule in
COL	Color	HDNR	Clear Floor Hardener	VWC	Vinyl Wall Covering		Specification Section 08 06 01.
CONC	Concrete	MATL	Material	WD	Wood		
CNTR	Counter	MDO	Medium Density Overlay	WRB	Water Resistant GWB		
CPT	Carpet	MET	Metal	WW	Window Wall		
CRC	Chemical-Resistant Coatings	PLAM	Plastic Laminate	Х	Open		
CT	Ceramic Tile	PLAS	Plaster				
EIFS	Exterior Insulation and Finish	PAVT	Paver Tile				
System	L	PLWD	Plywood				
EXP	Exposed Structure	PNL	Paneling				
		PTN	Partition				

	Space		Floor			Base	& Wain	scot		Тур	ical Wa	11		Other V	Wall			Ce	iling		]	Miscella	neous		Other
No.	Name	Sub Fl	Fnsh	Col	Hgt	Matl	Fnsh	Col	Walls	Matl	Fnsh	Col	Wall	Matl	Fnsh	Col	Hgt	Matl	Fnsh	Col	Item	Matl	Fnsh	Col	<b>Req'ments</b>
DIGES	TER CONTROL BU	ILDING																							
600	Boiler Room	CONC	HDNR	CL R	-	-	-	-	-	CMU	109	P1	-	-	-	-	Varies	EXP	-	-	-	-	-	-	
601	Stair	CONC	HDNR	CL R	-	-	-	-	-	CMU	109	P1	-	-	-	-	Varies	EXP	-	-	Stair & Railings	MET	107	P2	
602	Pump Room	CONC	HDNR	CL R	-	-	-	-	-	CONC	109	P1	-	-	-	-	Varies	EXP	-	-	-	-	-	-	
CONT	ROL AND DEWATE	ERING B	UILDING																						
8B1	Chemical Storage	CONC	CRC	F6	4"	CRC	-	F6	-	CONC	-	-	-	-	-	-	15'- 0"±	EXP	-	-					
801	Entry	CONC	RRUB	F2	4"	RUB	FCTY	F3	ALL	GWB	115	P1	S	CMU	109	P1	8'-0"	SAC	FCTY	White	-	-	-	-	
802	Corridor	CONC	RRUB	F2	4"	RESIL	FCTY	F3	ALL	GWB	115	P1	N	CMU	109	P1	8'-0"	SAC	FCTY	White	-	-	-	-	

#### SCHEDULES FOR FINISHES 09 06 00 SUPPLEMENT - 1

Item/Material	Finish	Color

Item/Material	Finish	Color
Metal Roofing		
Elastomeric Roofing		
Roof-Top Units	PS-107	P4
Prefabricated Fascia	FCTY	Kynar Dark Bronze No. 46
Flagpole		
Copings		
Stacks	PS-15	P4
Brick		
СМИ	PS-109	P3
Existing CMU, Where Noted	PS-109	P3
Fencing	FCTY	GALV
Ladders	PS-107	P4
Siding		
Soffits		
EIFS		
Exterior Railings		
Luminaire Poles		
FRP		
Interior Stair Railings		

### EXTERIOR FINISH SCHEDULE (EXAMPLE)

## COLOR LIST

### NOTES:

No. 1 Color selections for this Project may be noted in Door and Hardware Schedule, Interior Finish Schedule, Schedule, and on the Drawings, by the Letter-Number combination in the Mark column of this list.

No. 2 Some color selections may be made in various specification sections.

No. 3 Use only the colors noted or scheduled. If a color selection is not made, request one from Engineer.

Mark	Item	Manufacturer	Color	<b>Other Requirements</b>
F	FLOORS			
F-1				
F-2				
F-3				
W	WALLS			
W-1				
W-2				
0	OPENINGS			
O-1				
O-2				
O-3				
С	CEILING			
C-1				
Р	PAINTING AND STAIN			
P-1				
P-2				
F	FURNISHINGS			
N-1				
N-2				
N-3				

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Mark	Item	Manufacturer	Color	Other Requirements
А	ACCESSORIES & EQUIPMENT			
A-1				
A-2				
A-3				
Е	ELEVATORS			
E-1				
E-2				
E-3				
М	MISCELLANEOUS			
M-1				

SCHEDULES FOR FINISHES 09 06 00 SUPPLEMENT - 2 PW\JA\FED\D35899A2\30 FEBRUARY 2024 ©COPYRIGHT 2024 JACOBS

## COLOR LIST (EXAMPLE)

### NOTES:

- No. 1 Color selections for this project may be noted in Door and Hardware Schedule, Interior Finish Schedule, , and on the Drawings, by the Letter-Number combination in the Mark column of this list.
- No. 2 Some color selections may be made in various specification sections.
- No. 3 Use only the colors noted or scheduled. If a color selection is not made, request one from Engineer.

Mark	Item	Manufacturer	Color	Other Requirements
F	FLOORS			
F-1	Vinyl Composition Tile	Armstrong	Imperial Texture 51899 Cool	
			White	
F-2	Rubber Tile	Nora Flooring	925B-354-069 Teal	
F-3	Resilient Base, Top Set, Teal	Nora Flooring	0679 Teal	
F-4	Resilient Base, Sanitary, E	Nora Flooring	0716 Slate Gray	Inside/Outside/Straight Base
F-5	Resilient Base, Top Set, Gray	Nora Flooring	0882 Platinum Gray	
F-6	Concrete-Resistant Coating	Concrete Protection Systems, Inc.	Light Gray	
F-7	Ceramic Tile			
F-8	Quarry Tile			Non-Slip Surface
F-9	Carpeting			
F-10	Stair Treads			
F-11	Stair Risers			
F-12	Stair Landings			
F-13	Stone Tile			
F-14	Brick Pavers			
W	WALLS			
W-1	Brick			
W-2	Ceramic Tile			
W-3	Glazed CMU			
W-4	Vinyl Wall Covering			
W-5	Operable Partitions			
W-6	EIFS			

Mark	Item	Manufacturer	Color	Other Requirements
0	OPENINGS			
O-1	Window Frames			
O-2	Blinds	Levelor Corp.	817 Blush Grays	
O-3	Wall Louvers	Kynar		
С	CEILING			
C-1	Acoustical Layin Units	Armstrong-Ceiling Systems	White	
Р	PAINTING AND STAIN			
P-1	Paint	Pittsburgh Paints	2543 Doric (Off White)	
P-2	Paint	Pittsburgh Paints	7032 Green Glaze (Blue Green)	
P-3	Paint	Pittsburgh Paints	To Match Adjacent Surface	
P-4	Paint	Pittsburgh Paints	3759 Gray Suede	
P-5	Cementitious Coating			
F	FURNISHINGS			
N-1	Plastic Laminate Face	Wilson Art	SB010 Teal	
N-2	Plastic Laminate Tops	Wilson Art (Chemical Resistant)	SB010 Teal	
N-3	Laboratory Tops	Durcon	Black	
N-4	Lab Fume Hoods	Labconco	Beige 01	
N-5	Lab Canopy Hoods	Labconco	Paint to Match P2	
N-6	Vanity Unit			
N-7	Furniture	Not in scope		
N-8	Appliances			
А	ACCESSORIES AND EQUIPME	ENT		
A-1	Lockers			
A-2	Benches			
A-3	Toilet Partitions			
A-4	Chalk Boards			
A-5	Writing Boards			
A-6	Tack Boards			
A-7	HVAC Units & Convectors			
A-8	Drinking Fountains			

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Mark	Item	Manufacturer	Color	Other Requirements
A-9	Control Panels			
A-10	Electrical Panels			
A-11	Electric Water Coolers			
Е	ELEVATORS			
E-1	Hoistway Frames		No. 2D Stainless Steel	Example for dull finish
E-2	Hoistway Doors		No. 6 Stainless Steel	Example for dull satin finish
E-3	Car Frames		No. 4 Stainless Steel	Example for polished finish
E-4	Car Doors		No. 8 Stainless Steel	Example for reflective finish
E-5	Floor			As scheduled
E-6	Walls			On data sheets
E-7	Ceiling			On data sheets
E-8	Railings			On data sheets
М	MISCELLANEOUS			
	Aluminum			
	FRP			

## SECTION 09 22 16 NONSTRUCTURAL METAL FRAMING

# PART 1 GENERAL

## 1.01 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
  - 1. ASTM International (ASTM):
    - a. C645, Standard Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
    - b. C754, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum.

# 1.02 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Site in manufacturer's original, unopened, undamaged containers, with labels intact clearly indicating manufacturer and material.
- B. Storage:
  - 1. Store materials inside, under cover, stacked flat, off floor.
  - 2. Avoid overloading floor system of storage area.

# PART 2 PRODUCTS

## 2.01 MANUFACTURERS

- A. National Gypsum Company; Gold Bond.
- B. Dale/Incor.
- C. G-P Gypsum Corporation.
- D. United States Gypsum Company.

## 2.02 MATERIALS

- A. Furnish materials from a single manufacturer.
- B. Studs, Tracks, Furring Channels, and Accessories:
  - 1. ASTM C645.
  - 2. 20-gauge galvanized steel C-studs with 1-1/4-inch flanges and ancillary items.
  - 3. Sizes as shown on the Drawings.
  - 4. Furnished track to match gauge of C-studs.
- C. Carrying Channels: Cold-rolled steel, 16-gauge, free of rust, coated with factory-applied rust-inhibitive paint, 1-1/2 inches deep, weighing not less than 475 pounds per 1,000 linear feet.
- D. Furring Channels: Roll-formed hat shaped section of 25-gauge galvanized steel with a face width of 1-3/8 inches and a depth of 7/8-inch.
- E. Resilient Furring Channels:
  - 1. Roll-formed section of 25-gauge galvanized steel with face width of 1-1/2 inches designed for resilient attachment of gypsum board to framing.
  - 2. Manufacturers and Products:
    - a. United States Gypsum; RC-1 channel.
    - b. Gold Bond; resilient channels.
- F. Z Furring Channels: U.S. Gypsum or Gold Bond.

## PART 3 EXECUTION

- 3.01 ERECTION
  - A. Preparation: Provide, install, and maintain necessary scaffold, staging, trestles, planking, and temporary heating, lighting, and ventilation as necessary for duration of gypsum board work.
  - B. Field Measurements: Take and record measurements before fabrication of assemblies.
  - C. Layout: Align partitions as shown on the Drawings.

# D. Tracks:

- 1. Attach metal runner tracks to floor slabs with suitable fasteners located 2 inches from each end and spaced not more than 24 inches OC.
- 2. Attach tracks to suspended ceiling with toggle or molly bolts spaced 24 inches OC.
- E. Studs and Other Framing:
  - 1. ASTM C754.
  - 2. Following manufacturer's printed instructions, position studs vertically, engaging floor and ceiling tracks and spaced as noted on the Drawings.
  - 3. Splices: Not allowed.
  - 4. Place in direct contact with doorframe jambs, abutting partitions, and partition corners. Provide for anchorage of doorframes to studs.
  - 5. Anchor all studs for shelf-walls and those adjacent to window and doorframes, partition intersections, and corners to ceiling and floor runner flanges. Securely anchor studs to jamb and head anchor clips of door or borrowed-light frames by bolt or screw attachment.
  - 6. Over metal door and borrowed-light frames, place horizontally a cut-tolength section of runner, with a web-flanged bend at each end, and secure with one positive attachment per flange. Position a cut-to-length stud (extending to ceiling runner) at vertical panel joints over doorframe header.
  - 7. Locate studs at abutting construction, partition intersections, and partition corners.
  - 8. Spacing: 16 inches OC, unless noted otherwise on the Drawings or required by manufacturer.
  - 9. Doorframes and Cased Openings:
    - a. Full height double studs, No. 20-gauge minimum, secured to jamb anchors by bolts, screws, or welds.
    - b. Header Track: Secure to frame head anchors and double studs.
    - c. Provide double channel stiffeners through studs above frame and extend at least one stud space beyond each jamb.
  - 10. Wall Mounting Accessories: Provide channels, horizontal studding, No. 16-gauge sheet 8 inches by 2 inches greater than stud spacing, or other members within walls as required to provide secure and adequate support.
- F. Furring:
  - 1. Space furring channels the same as studs or as shown.
  - 2. Around columns and beams construct furring as shown using metal studs and furring channels securely tied together and anchored in-place.
  - 3. Attach resilient furring channels to wood framing with screws.

PW\JA\FED\D35899A2\30 FEBRUARY 2024 ©COPYRIGHT 2024 JACOBS G. Leave framing, plumb, aligned, securely anchored, braced, and ready to receive gypsum board.

# END OF SECTION

NONSTRUCTURAL METAL FRAMING 09 22 16 - 4

# SECTION 09 29 00 GYPSUM BOARD

## PART 1 GENERAL

### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. American National Standards Institute (ANSI): A118.9, Test Methods and Specifications for Cementitious Backer Units.
  - 2. ASTM International (ASTM):
    - a. C475/C475M, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
    - b. C514, Standard Specification for Nails for the Application of Gypsum Board.
    - c. C645, Standard Specification for Nonstructural Steel Framing Members.
    - d. C754, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
    - e. C840, Standard Specification for Application and Finishing of Gypsum Board.
    - f. C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
    - g. C1047, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
    - h. C1396/C1396M, Standard Specification for Gypsum Board.
    - i. D5420, Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
    - j. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
    - k. E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
    - 1. E119, Standard Test Methods for Fire Tests of Building Construction and Materials.
    - m. E413, Classification for Rating Sound Insulation.
    - n. E695, Standard Test Method of Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.

- 3. Gypsum Association (GA):
  - a. 214, Recommended Levels of Gypsum Board Finish.
  - b. 216, Application and Finishing of Gypsum Panel Products.
- 4. UL: UL Fire Resistance Directory.

## 1.02 SUBMITTALS

- A. Submittals:
  - 1. Manufacturer's list of items and materials proposed for use, with descriptive literature for each system used.
  - 2. LEED: Manufacturer's product data for sealants including printed statement of VOC content and material safety data sheets. (LEED credit IEQ 4.1).

## 1.03 QUALITY ASSURANCE

- A. General: Regardless of the minimum specifications herein, utilize materials and applications recommended by manufacturer.
- B. Applicator's Qualifications: Use only workers regularly employed in this type of work who can show experience in application of similar materials and specific systems specified.
- C. Single Source Responsibility: Use gypsum board and related joint treatment materials from a single manufacturer for each type used.
- D. Fire-Test-Response Characteristics: Provide materials and construction identical to those tested in the assembly indicated or scheduled on the Drawings, according to ASTM E119 or UL Fire Resistance Directory
- E. Sound Transmission Characteristics: Provide materials and construction identical to those tested in the assembly indicated or scheduled on the Drawings, according to ASTM E90 and classified according to ASTM E413.

## 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver fire-rated materials bearing testing agency label and required fire classification numbers.
- B. Storage:
  - 1. Store materials inside, under cover, stacked flat, off floor.
  - 2. Stack gypsum board so that long lengths are not over short lengths.

GYPSUM BOARD 09 29 00 - 2

- 3. Avoid overloading floor system of storage area.
- 4. Store finishing compounds in dry areas; protect against freezing at all times.

# 1.05 ENVIRONMENTAL CONDITIONS

- A. Temperature: In areas receiving gypsum board installation, maintain minimum temperature of 40 degrees F for 48 hours before, during, and after gypsum board application. Maintain minimum temperature of 50 degrees F for 48 hours before, during, and after application of adhesive methods of attachment and finishing compounds until drying is complete.
- B. Ventilation:
  - 1. Provide ventilation during and following joint treatment applications.
  - 2. Use temporary air circulators in enclosed areas lacking natural ventilation.
  - 3. Under slow drying conditions, allow additional drying time between coats of joint treatment.
  - 4. Protect installed materials from drafts of ambient air during hot, dry weather.
  - 5. Protect materials from drying too rapidly during hot and dry weather.

# PART 2 PRODUCTS

## 2.01 GYPSUM BOARD

A. Fire-Rated Board (GWBX): ASTM C1396/C1396M, Type X, 5/8-inch thick with tapered edges.

# 2.02 FASTENERS

- A. Gypsum Board:
  - 1. Screws: ASTM C1002, self-drilling, self-tapping, bugle head, for use with power-driven tool. Type S, 1-inch long for gypsum board to sheet metal.

# 2.03 JOINT TREATMENT MATERIALS

- A. Tape:
  - 1. General Interior Applications: ASTM C475/C475M, perforated paper tape.

- B. Compound:
  - 1. General Interior Applications: ASTM C475/C475M, all-purpose, readymixed compound.

## 2.04 ANCILLARY MATERIALS

A. Adhesives: As recommended by gypsum board manufacturer for intended use. Use adhesives that have VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

### 2.05 TRIM ACCESSORIES

- A. ASTM C1047, Zinc-Coated Metal.
- B. Manufacturers and Products:
  - 1. Corner Bead:
    - a. 1-1/4 inches by 1-1/4 inches:
      - 1) United States Gypsum; Dur-A-Bead.
      - 2) Gold Bond; standard corner beads.
  - 2. Edge Trim:
    - a. United States Gypsum; 200B metal trim.
    - b. Gold Bond; No. 200 casing bead.

## 2.06 NONSTRUCTURAL METAL FRAMING MEMBERS

- A. Sizes and Gauge: As noted in Section 09 22 16, Nonstructural Metal Framing.
- B. Manufacturers:
  - 1. United States Gypsum.
  - 2. Dale/Incor.
  - 3. Gold Bond.
  - 4. Unimast, Inc.

#### 2.07 SPRAY TEXTURE

- A. Manufacturers and Products:
  - 1. Nonaggregate Finish:
    - a. National Gypsum Company; ProForm Perfect Spray EM/HF.
    - b. United States Gypsum Co.; SHEETROCK Wall and Ceiling Spray Texture (unaggregated).

# PART 3 EXECUTION

## 3.01 EXAMINATION

A. Inspect surfaces to receive gypsum board and related materials before beginning work and report to Engineer any defects in such Work which will adversely affect the quality of Work specified herein.

#### 3.02 PREPARATION

- A. General: Provide, install, and maintain necessary staging, trestles, planking, and temporary heating, lighting, and ventilation as necessary for duration of gypsum board work.
- B. Protection: Protect Work of other trades.
- C. Coordination:
  - 1. Coordinate Work with that of other trades. Check Specifications and Drawings of other trades to determine parts of Work requiring coordination.
  - 2. Cut and repair gypsum board systems for installation of omitted work.
- D. Surface Preparation: Repair defective surfaces prior to starting work. Prepare as specified for application of specific materials.

## 3.03 ERECTION OF LIGHT-GAUGE NONSTRUCTURAL METAL FRAMING

- A. Layout: Align partitions as shown on the Drawings.
- B. Tracks:
  - 1. Attach metal runner tracks to floor slabs with suitable fasteners located 2 inches from each end and spaced not more than 24 inches OC.
  - 2. Where partitions terminate at framed ceilings attach top tracks to suspended ceiling with toggle or molly bolts spaced 24 inches OC.
- C. Studs:
  - 1. ASTM C754.
  - 2. Following manufacturer's printed instructions, position studs vertically, engaging floor and ceiling tracks and spaced as noted on the Drawings.
  - 3. Splice: Not allowed.
  - 4. Place in direct contact with doorframe jambs, abutting partitions, and partition corners. Provide for anchorage of doorframes to studs.
  - 5. Anchor studs for shelf-walls and those adjacent to doorframes, partition intersections, and corners to ceiling and floor runner flanges. Securely

anchor studs to jamb and head anchor clips of door or borrowed-light frames by bolt or screw attachment.

- 6. Over metal door and borrowed-light frames, place horizontally a cut-tolength section of runner, with a web-flanged bend at each end, and secure with one positive attachment per flange. Position a cut-to-length stud (extending to ceiling runner) at vertical panel joints over doorframe header.
- 7. Locate studs at abutting construction, partition intersections, and partition corners.
- 8. Spacing: At 16 inches OC, unless otherwise required by manufacturer.
- 9. At Doorframes:
  - a. Full height double studs, No. 20 gauge minimum, secured to jamb anchors by bolts, screws, or welds.
  - b. Header Track: Secure to frame head anchors and double studs.
  - c. Provide double channel stiffeners through studs above frame and extend at least one stud space beyond each jamb.
- 10. Wall Mounting Accessories: Provide channels, horizontal studding, No. 16 gauge sheet 8 inches by 2 inches greater than stud spacing, or other members within walls as required to provide secure and adequate support.

## 3.04 APPLICATION OF GYPSUM BOARD

- A. Inspection and Preparation:
  - 1. Check framing for accurate spacing and alignment.
  - 2. Verify spacing of installed framing does not exceed maximum allowable for thickness of gypsum board to be used.
  - 3. Verify frames are set for thickness of gypsum board to be used.
  - 4. Do not proceed with installation of gypsum board until deficiencies are corrected and surfaces to receive gypsum board are acceptable.
  - 5. Repair protrusions of framing, twisted framing members, or unaligned members before installation of gypsum board is started.
- B. General:
  - 1. Meet requirements of ASTM C840 and GA 216.
  - 2. Joints: Use gypsum board of maximum lengths to minimize end joints. Stagger end joints when they occur. Locate end joints as far as possible from center of wall or ceiling. Abut gypsum board without forcing. Neatly fit ends and edges of gypsum board. Do not place butt ends against tapered edges.
  - 3. Support ends and edges of gypsum board panels on framing or furring members except for face layer of double layer and where ends are back blocked and floated.

- 4. Use metal edge trim where gypsum board abuts another material, at corners, and where shown or noted on the Drawings.
- 5. Follow manufacturer's recommendation of good practice.
- C. Over Framing:
  - 1. Apply gypsum board first to ceiling and then to walls for single layer horizontal application.
  - 2. Use vertical application for fire-rated walls.
  - 3. Fasten gypsum board securely to framing using double screw method.
- D. Fireproofing:
  - 1. Install fireproofing of columns, beams, and shaft walls as shown.
  - 2. Close tops of elevator hoist ways with horizontal metal framing and gypsum board to provide 2-hour rated assembly.

## 3.05 JOINT SYSTEM FOR GYPSUM WALLBOARD

- A. Interior Gypsum Board: Conform to ASTM C840.
- B. Required: On exposed gypsum board.
- C. Prefill: Fill V-grooves formed by abutting rounded edges of gypsum board with prefill joint compound. Fill V-joint flush and remove excess compound beyond groove. Leave clear depression to receive tape. Permit prefill joint compound to harden prior to application of tape.
- D. Taping and Finishing Joints:
  - 1. Taping or Embedding Coat: Apply compound in thin, uniform layer to joints and angles to be reinforced. Apply reinforcing tape immediately. Center tape over joint and seat tape into compound. Leave approximately 1/64-inch to 1/32-inch compound under tape to provide bond. Apply skim coat immediately following tape embedment but not to function as fill or second coat. Fold tape and embed in angles to provide true angle. Dry embedding coat prior to application of fill coat.
  - 2. Filling Coat: Apply joint compound over embedding coat. Fill taper flush with surface. Apply fill coat to cover tape. Feather out fill coat beyond tape and previous joint compound line. For joints with no taper, feather out at least 4 inches on either side of tape. Do not apply fill coat on interior angles. Allow fill coat to dry prior to application of finish coat.
  - 3. Finishing Coat: Spread joint compound evenly over and beyond fill coat on joints. Feather to smooth uniform finish. Apply finish coat to taped

angles to cover tape and taping compound. Sand final application of compound to provide surface ready for decoration.

- 4. Filling and Finishing Depressions: Apply joint compound as first coat to fastener depressions. Apply at least two additional coats of compound after first coat is dry. Leave filled and finished depressions level with plane of surface.
- E. Finishing Beads and Trim:
  - 1. First Fill Coat: Apply joint compound to bead and trim. Feather out from ground to plane of the surface. Dry compound prior to application of second fill coat.
  - 2. Second Fill Coat: Apply joint compound in same manner as first fill coat. Extend beyond first coat onto face of gypsum board. Dry compound prior to application of finish coat.
  - 3. Finish Coat: Apply joint compound to bead and trim. Extend beyond second fill coat. Feather finish coat from ground to plane of surface. Sand finish coat to provide flat surface ready for decoration.

# 3.06 FINAL FINISHES FOR GYPSUM WALLBOARD

- A. Levels of Finish: Conform to GA 214.
- B. Level 4:
  - 1. Taping, filling, and finishing coats plus two separate coats applied over joints, angles, fastener heads, and trim accessories.
  - 2. Sand between coats and after last coat.
  - 3. Use on surfaces indicated to receive wall coverings.

## 3.07 SPRAY TEXTURE

- A. Application:
  - 1. Apply on gypsum board wall and ceiling surfaces following manufacturer's printed directions for a medium build orange peel texture.
  - 2. Before texture application, finish gypsum board as specified for Level 3.
  - 3. When surfaces are prepared and dry, apply sealer and allow to dry. Mix texture finish material as directed by manufacturer.
  - 4. Use spray equipment of a size and type to assure acceptable results.
  - 5. Apply by spray only at a coverage rate as recommended by manufacturer and in accordance with directions printed on container. Apply material to blend uniformly and cover fully without starved spots or other evidence of thin application. Provide uniform texture without application patterns.

## 3.08 ADJUST AND CLEAN

- A. Clean: Remove droppings or texture overspray from walls, windows, and floor, leaving room clean for following trades.
- B. Nail Pop: Repair nail pop by driving new nail approximately 1-1/2 inches from nail pop and reseat nail. When face paper is punctured, drive new nail or screw approximately 1-1/2 inches from defective fastening and remove defective fastening. Fill damaged surface with compound.
- C. Ridging:
  - 1. Do not repair ridging until condition has fully developed, approximately 6 months after installation or one heating season.
    - a. Sand ridges to reinforcing tape without cutting through tape.
    - b. Fill concave areas on both sides of ridge with topping compound.
    - c. After fill is dry, blend in topping compound over repaired area.
  - 2. Fill cracks with compound and finish smooth and flush.

# **END OF SECTION**

## SECTION 09 65 00 RESILIENT FLOORING

## PART 1 GENERAL

### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. ASTM International (ASTM):
    - a. D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers Tension.
    - b. D570, Standard Test Method for Water Absorption of Plastics.
    - c. D2047, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
    - d. E595, Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment.
    - e. E648, Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source.
    - f. E662, Test Method for Specific Density of Smoke Generated by Solid Materials.
    - g. F970, Test Method for Static Load Limit.
    - h. F1066, Standard Specification for Vinyl Composition Floor Tile.
    - i. F1303, Standard Specification for Sheet Vinyl Floor Covering with Backing.
    - j. F1344, Standard Specification for Rubber Floor Tile.
    - k. F1515, Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change.
    - 1. F1700, Standard Specification for Solid Vinyl Floor Tile.
    - m. F1859, Standard Specification for Rubber Sheet Floor Covering without Backing.
    - n. F1861, Standard Specification for Resilient Wall Base.
    - o. F2034, Standard Specification for Sheet Linoleum Floor Covering.
    - p. F2195, Standard Specification for Linoleum Floor Tile.
    - q. G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
  - 2. National Fire Protection Association (NFPA):
    - a. 253, Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source.
    - b. 258, Test Method for Specific Density of Smoke Generated by Solid Materials.

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### 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Samples: Two 2-1/2-inch-wide strips of base material proposed for use.
- B. Informational Submittals:
  - 1. Manufacturer's certificate of compliance.
  - 2. Operation and Maintenance Data: List of recommended maintenance products, methods, and procedures.

### 1.03 DELIVERY, STORAGE, AND HANDLING

A. Store materials in original containers at not less than 70 degrees F ambient temperature for not less than 24 hours immediately before installation.

### 1.04 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperature in space to receive base between 70 degrees F and 90 degrees F for not less than 24 hours before and 48 hours after installation.
- B. Maintain minimum temperature of 55 degrees F after base is installed, except as specified above.

#### 1.05 EXTRA MATERIALS

A. Furnish additional base materials from same production run as installed material at the rate of 10 linear feet for each 100 linear feet.

#### 1.06 SEQUENCING AND SCHEDULING

A. Do not install base material until wall finish has been applied and is finished drying per manufacturer recommendations.

## PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Flooring products of the following manufacturers, meeting these Specifications, may be used on this Project:
  - 1. Afco Rubber Corp. (nosings, treads, and transitions).
  - 2. Armstrong World Industries, Inc.
  - 3. Azrock Floor Products.
  - 4. Burke Flooring Products.

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- 5. Congoleum Corp.
- 6. Endura, Division of the American Biltrite.
- 7. Forbo Flooring System.
- 8. Tarkett/Johnsonite.
- 9. Marley Flexco.
- 10. Mannington Commercial.
- 11. Nora Flooring, Division of Robus Products Corp.
- 12. R. C. Musson Rubber Co.
- 13. Roppe (base).
- 14. VPI Corporation.

## 2.02 RESILIENT BASE

- A. General: ASTM F1861, uniform in 0.125-inch thickness and in as long lengths as practicable to suit conditions of installation.
  - 1. Factory premolded internal and external corners to match base when available. Where resilient base is indicated, use rubberbase.
  - 2. Rubber Base: Type TP, Group 1.
  - 3. Style: Cove.
  - 4. 6 inches high, match existing.
- B. Manufacturers and Products:
  - 1. Armstrong; Color-Integrated Wall Base.
  - 2. Johnsonite; Traditional Wall Base.

## 2.03 ACCESSORIES

- A. Adhesive: Type and brands of adhesive as recommended by manufacturer of floor covering material for conditions of installation.
- B. Primer and Crack Filler: Type and brand recommended by floor covering manufacturer.

# PART 3 EXECUTION

## 3.01 EXAMINATION

- A. Examine substrate for excessive moisture content and unevenness preventing execution and quality of resilient flooring as specified.
- B. Correct defects before installation of resilient flooring.

### 3.02 PREPARATION

- A. Remove dirt, oil, grease, or other foreign matter from surfaces to receive base materials.
- B. Prime surfaces, other than wood, if recommended by floor covering manufacturer.

### 3.03 APPLICATION OF ADHESIVES

- A. Mix and apply adhesives in accordance with manufacturer's instructions.
- B. Provide safety precautions during mixing and applications as recommended by adhesive manufacturer.
- C. Apply uniformly over surfaces:
  - 1. Cover only amount of area that can be covered by base material within recommended working time of adhesive.
  - 2. Remove any adhesive that dries or films over.
  - 3. Do not soil walls, bases, or adjacent areas with adhesives.
  - 4. Promptly remove any spillage.
- D. Apply adhesives with notched trowel or other suitable tool.
- E. Clean trowel and rework notches as necessary to ensure proper application of adhesive.

#### 3.04 INSTALLATION OF BASE

- A. General: Remove defects in wall and floor that would prevent level and true installation of base material.
  - 1. Install base around perimeter of room or space, where shown, and at toe spaces of casework and cabinets.
  - 2. Unroll base material and cut into accurate lengths as desired or as required for minimum number of joints.
  - 3. Match edges at seams or double cut adjoining lengths to give continuous appearance.
  - 4. Install with tight butt joints with no joint widths greater than 1/64 inch.
- B. Top-Set Base:
  - 1. Apply adhesive and firmly adhere to wall surfaces.
  - 2. Press down so bottom cove edge follows floor profile.
  - 3. Ensure top and bottom edges of base are in firm contact with walls and floors.

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- 4. Form internal and external corners by using premolded corners. Other methods, acceptable to Engineer, may be used if premolded corners are not available.
- 5. Scribe base accurately to abutting materials.

# 3.05 INSTALLATION OF STAIR COVERING

- A. Cut each piece of covering material to lengths as required. Allow to flatten prior to installation. Match grain and color between adjacent pieces. Install with tight butt joints with no joint width greater than 1/64 inch.
- B. For treads and landings apply adhesive and securely adhere tread material to substrate. Finish flush with nosing where separate nosings are required.
- C. Set riser after tread material. Apply adhesive and securely bond riser material to substrate. Roll for firm bond. Work out wrinkles and air pockets.
- D. Apply stringer material in lengths as long as practical with minimum joints. Cut to accurate shapes for stair profiles. Apply adhesive and securely adhere to substrates in same manner as specified for top-set base materials.

## 3.06 CLEANING AND PROTECTION

- A. Upon completion of the installation of base, and after materials have set, clean surfaces with a neutral cleaner as recommended by manufacturer for type of base material installed.
- B. Repair adjacent surfaces damaged by installation.
- C. Protect completed Work from traffic and damage until Substantial Completion.

## 3.07 INSTALLATION SCHEDULE

A. Areas to receive resilient flooring, and pattern, are indicated in Interior Finish Schedule in Section 09 06 00, Schedules for Finishes.

# **END OF SECTION**

## SECTION 09 90 05 ARCHITECTURAL PAINTING

## PART 1 GENERAL

### 1.01 DEFINITIONS

- A. Terms used in this section:
  - 1. Coverage: Total minimum dry film thickness in mils, or square feet per gallon.
  - 2. FRP: Fiberglass Reinforced Plastic.
  - 3. HCl: Hydrochloric Acid.
  - 4. MDFT: Minimum Dry Film Thickness.
  - 5. MDFTPC: Minimum Dry Film Thickness Per Coat.
  - 6. mil: Thousandth of an inch.
  - 7. Military Specification-Paint.
  - 8. PSDS: Paint System Data Sheet.
  - 9. SFPG: Square Feet Per Gallon.
  - 10. SFPGPC: Square Feet Per Gallon Per Coat.
  - 11. SP: Surface Preparation.
  - 12. Existing: Those coated surfaces that are cut into, connected to, or otherwise changed or affected by the work of this contract.
- B. Paint Terms: Conform to ASTM D16.

## 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data: Manufacturer's descriptive literature for coating materials and coating application accessories.
    - a. For each paint system used, furnish a Paint System Data Sheet (PSDS) and technical data sheet for each product used in the paint system. PSDS form is appended to the end of this section.
    - b. Submit required information on a system by system basis.
    - c. Provide copies of paint system submittals to applicator.
  - 2. Verification Samples: Two samples, minimum size 6 inches (152 mm) square, representing actual color and finish of each finish coating type, color, and finish to be applied.

- B. Informational Submittals:
  - 1. List of references substantiating applicator's experience.
  - 2. Manufacturer's printed application instructions for each product, including product storage requirements and surface preparation requirements.

## 1.03 QUALITY ASSURANCE

A. Applicator's Experience: Minimum 5 years' practical experience in application of specified products and approved by the paint manufacturer.

## 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products of this Section in manufacturer's unopened packaging until installation.
- B. Establish and maintain storage area conditions for products of this Section in accordance with manufacturer's instructions until installation.
- C. Store and dispose of solvent-based materials, and materials used with solventbased materials, in accordance with requirements of local authorities having jurisdiction over Project.

## 1.05 PROJECT CONDITIONS

- A. Do not apply coatings to exterior surfaces except under environmental conditions recommended by coating manufacturer.
- B. Establish and maintain environmental conditions recommended by coating manufacturer before, during, and after application of coatings to interior surfaces.
- C. During application of coating materials, post "WET PAINT" signs.
- D. During application of solvent-based materials, post "NO SMOKING" signs.

# 1.06 SEQUENCING

A. Do not allow application of finish coats in an area until moisture-producing construction activities, dust-producing construction activities, and other construction activities which could impair performance or appearance of finish coatings, have been completed in that area.
## 1.07 EXTRA MATERIALS

- A. Supply for each finish coating material, color, and finish specified 2 gallons (7.75L) of paint material, in sealed 1-gallon (3.875L) containers, marked with color and finish identification.
- B. Custom Colors: Provide details of color formulae and product availability.

## PART 2 PRODUCTS

- 2.01 MANUFACTURERS
  - A. Manufacturers:
    - 1. Products of the following manufacturers, meeting these specifications, may be used on this Project:
      - a. Ameritone, Long Beach, CA.
      - b. Fuller/O'Brien Paint Company, San Francisco, CA.Benjamin Moore Paint Company, San Francisco, CA.
      - d. Pratt & Lambert, Inc., Buffalo, NY.
      - e. Sherwin Williams, Cleveland, OH.
      - f. Duron, Inc., Beltsville, MD.
  - B. Unless otherwise specified for an individual product or material, supply products specified in this section from the same manufacturer.

#### 2.02 MATERIALS

- A. General:
  - 1. Unless otherwise indicated, furnish factory-mixed paints. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not dilute or thin paints, except as instructed.
  - 2. Do not add additives, except as instructed or recommended by paint manufacturer.
  - 3. Furnish each coating material in quantity required for this section from a single production run.
  - 4. Colors: To be selected by Architect from manufacturer's full range of available colors.
- B. Paint Application Accessories: As specified in this section or as recommended by paint manufacturer's application instructions, including but not limited to thinners, sealers, primers, cleaning agents, etching agents, cleaning cloths, sanding materials, and clean-up materials.

- C. Interior-Exterior Latex, Highgloss: Sherwin-Williams; A41 High-Gloss A41W01253.
- D. Latex Primer: Sherwin-Williams; Premium Wall and Wood B28W800.

## PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Immediately prior to coating application, ensure that surfaces to receive coatings are dry.
- B. Ensure that moisture-retaining substrates to receive coatings have moisture content within tolerances allowed by coating manufacturer, using moisture measurement techniques recommended by coating manufacturer.
- C. Immediately prior to coating application, examine surfaces to receive coatings for surface imperfections and for contaminants which could impair performance or appearance of coatings, including but not limited to, loose primer, rust, scale, oil, grease, mildew, algae, or fungus, stains or marks, cracks, indentations, or abrasions.
- D. Correct the above conditions and other conditions that could impair performance or appearance of coatings in accordance with specified surface preparation procedures before proceeding with coating application.

#### 3.02 PREPARATION

- A. Do not start Work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.
- B. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; cover stains and marks which cannot be completely removed with isolating primer or sealer recommended by coating manufacturer to prevent bleed-through.
- C. Mildew, Algae, and Fungus: Remove, using materials and methods recommended by coating manufacturer.
- D. Remove dust and loose particulate matter from surfaces to receive coatings immediately prior to coating application.
- E. Remove or protect hardware, electrical plates, mechanical grilles and louvers, lighting fixture trim, and other items not indicated to receive coatings that are adjacent to surfaces to receive coatings.

- F. Existing Painted Surfaces: Remove loose and peeling paint. Degloss surface if recommended by manufacturer. Sand smooth. Clean entire surface prior to painting.
- G. Gypsum Board: Repair cracks, holes, indentations, and other surface defects using joint compound to produce surface flush with adjacent undamaged surface; sand to produce uniform flat surface when dry.
- H. Metal Doors: Seal top and bottom edges with specified primer.

## 3.03 APPLICATION

- A. Apply paint where indicated in Interior Finish Schedule.
- B. Apply each coat to uniform coating thickness following manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.
- C. For opaque finishes, tint each coat, including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
- D. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.
- E. Inspect each coat before applying next coat; touch-up surface imperfections with coating material, feathering, and sanding if required; touch-up areas to achieve flat, uniform surface without surface defects visible from 5 feet (1.5 m).
- F. Remove dust and other foreign materials from substrate immediately prior to applying each coat.
- G. Where coating application abuts other materials or other coating color, terminate coating, making clean sharp termination line without coating overlap.
- H. Where color changes occur between adjoining spaces, through framed openings that are of same color as adjoining surfaces, change color at outside stop corner nearest to face of closed door.
- I. Re-prepare and recoat unsatisfactory finishes; refinish entire area to corners or other natural terminations.

## 3.04 ITEMS NOT TO BE PAINTED

- A. Do not paint the following:
  - 1. Items specified or provided with factory finish.
  - 2. Stainless steel, anodized aluminum, bronze, terne, or lead.
  - 3. Equipment nameplates, fire rating labels, and operating parts of equipment.
  - 4. Concealed piping, ductwork, and conduit.
- B. Materials and products having factory-applied primer are not considered factory finished.

#### 3.05 PAINT SYSTEMS

A. System No. 115 Gypsum Board and Plaster, Highgloss:

Surface Prep.	Paint Material	Min. Coats, Cover
Gypsum Board or Plaster	Latex Primer/Sealer	1 coat, 3.0 MDFT
	Acrylic Latex Highgloss	2 coats, 1.3 MDFTPC

#### 3.06 SUPPLEMENT

- A. The supplements listed below, following "End of Section," is a part of this Specification.
  - 1. Paint System Data Sheet (PSDS).

# END OF SECTION

## PAINT SYSTEM DATA SHEET (PSDS)

Complete and attach manufacturer's Technical Data Sheet to this PSDS for <u>each</u> coating system.

Paint System Number (from Sp	pec.): 107.5GL	
Paint System Title (from Spec.)	): All Surface Enamel – Interior/	Exterior Latex High Gloss
Coating Supplier: Sherwin Wil	liams	
Representative:		
Surface Preparation: Clean		
Paint Material (Generic)	Product Name/Number (Proprietary)	Min. Coats, Coverage
Latex Enamel	All Surface Enamel A41	2
Paint System Number (from Sp	bec.): 108.38	
Paint System Title (from Spec.)	): Premium Wall & Wood Interio	or Latex Primer
Coating Supplier: Sherwin Wil	liams	
Representative:		
Surface Preparation: Clean		
Paint Material (Generic)	Product Name/Number (Proprietary)	Min. Coats, Coverage
Latex Primer	Interior Latex Primer B28W08111	1

#### SECTION 14 20 10 GENERAL CONDITIONS AND SPECIFICATIONS FOR FULL SERVICE PREVENTIVE MAINTENANCE

## PART ONE- SCOPE OF WORK

#### **1.01 GENERAL**

- A. Elevator Contractor, (hereinafter referred to as "Contractor") shall perform Full Service Maintenance (hereinafter referred to as the "Services" and/or the "Work" on elevator equipment specified herein which shall include preventive maintenance services. All equipment under this contract shall be maintained in first-class operating condition. Contractor shall furnish all materials and labor and comply with all requirements of current elevator codes. Contractor shall place into operation a continuing system of full preventive maintenance to provide necessary systematic services and preventive maintenance for the equipment described herein.
- B. The Contractor shall not be excused from elevator shut downs allegedly caused by "faulty or dirty" building incoming electrical power unless the Contractor provides the fault log showing there was a power failure resulting in equipment shut-down on date of service call and Owner confirms there was a valid brown-out or building power failure.
- C. All service, repair and maintenance shall be conducted in a manner consistent with Owner's intent to provide uninterrupted service. The specified equipment must provide reliable and safe transportation on a continuous basis, twenty-four (24) hours a day, seven (7) days a week, three hundred sixty-five (365) days per year.

Contractor agrees to accept full responsibility for the equipment, as it exists on the effective date of this Contract, and to leave it in a condition acceptable to Owner at the termination date.

- D. The Owner may at any time employ the services of an Elevator Consultant to mediate any disputes between the Owner and the Contractor. The cost of such disputes shall be borne equally by the Owner and the Contractor.
- E. The Owner reserves the right to contract separately with the Contractor, or any other firm of the Owner's choice, for modernization or upgrade of elevator equipment. A thirty (30) day notice shall be sent to the Contractor if the Owner elects to select an alternate Elevator Contractor for modernization or upgrade of the equipment. There shall be no monetary payment to the Contractor for early termination of this agreement. Any upgrades or component changes to the elevator system shall be warranted by the Contractor modernizing or upgrading the equipment, for a period of one year, commencing when the modernization or upgrade has been accepted by Owner, Idaho Elevator Inspector and Elevator Consulting Services, Inc., which also includes the Contractor's completion of all punch list items required by the Owner, Elevator Inspector and Elevator Consulting Services, Inc. At the end of the warranty period the GENERAL CONDITIONS

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Modernization

upgrades or component changes shall be included in the scope of work and covered by the terms of this maintenance agreement, at no additional cost.

- F. Neither Owner nor Contractor may assign this Contract without the written consent of the other party.
- G. No covenant or condition of the Contract may be waived, except by the written consent of the other party. Forbearance or indulgence by either party in any regard whatsoever shall not constitute a waiver of a covenant or condition to be performed by the other party.
- H. Any written notification required to be provided pursuant to the terms of this Contract shall be by means of hand delivery, overnight US Mail or private carrier, or by prepaid postage, certified mail, with a return receipt required. The notice shall be effective upon the date of transmission by the sending party.
- I. Any amendment to this Contract shall be in writing and signed by each duly authorized representative(s) for each respective organization executing this Contract.
- J. Sections 1, 10, 13, 14, 20 and 34 of Exhibit B, General Conditions for [CHOICE TEXT] Modernization, of this Contract between Owner and Contractor, are incorporated herein by reference.

## **1.02 CONTACT ADDRESSES**

# **1.03 PROTOCOL COMPLIANCE**

A. Contractor shall insure that any and all protocols regarding the provision of Contract services established by Owner shall be specifically followed. Contractor shall work with Owner, and any authorized firm contracted to Owner, to insure proper compliance with said protocols.

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Garage Elevator #4 Elevator

# Modernization

## **1.04 SERVICE QUALITY VALIDATION**

A. Insofar as the services provided by the Contractor fails to comply with required standards or has not been provided as per Owner established protocols, Owner shall not be obligated to reimburse Contractor for any such service until such deficiencies have been corrected by the Contractor and a successful re-inspection by Owner or Elevator Consultant is completed.

## **1.05 CONTRACT ADMINISTRATION**

A. Notwithstanding any other provisions of this Contract, or any document referenced herein, Owner, or other authorized representative, shall be the only entity authorized to make changes in or redirect the work required by this Contract. Where the Owner's approval is required under the terms of this Contract, it shall be construed to mean the approval of Owner. In the event Contractor effects any change at the direction of any other individual, the change shall be considered as having been made without authority and an adjustment shall not be made to the Contract price or performance requirements as a result thereof.

## 1.06 INTENT AND ACCEPTANCE

A. Contractor acknowledges that Owner has provided free access to and sufficient time for adequate examination of the equipment and review of service records. Contractor further acknowledges that the specified equipment listed has been inspected by Contractor and that Contractor has determined that it is in serviceable operating condition. Contractor accepts full and complete responsibility for Full Service Maintenance and Repair of the specified equipment listed, as is condition, in accordance with this Contract.

#### **1.07 DEFINITIONS**

- A. Preventive Maintenance: Those services required by Contractor is to provide Preventive Maintenance as defined in this Contract, to prevent malfunctions or shutdowns due to normal wear and tear, to provide for safe operating equipment and to prolong the life of all equipment.
- B. Cleanliness: The Contractor is required to maintain the entire elevator system in a clean manner at all times. This includes but is not limited to: removal of oily rags, removal of dirt, grease, and lint, maintaining the exterior of all equipment free of lint, dirt, oil, grease, clean all machine room equipment including, floors, controller/selector, car top, hoistway door track, hanger, interlock, header, strut, hoistway side of sills, underside of car platform, car guides, car door operator, track, hangers, inside area of header, crosshead, guide rail/bracket, fascia, dust cover, pit and inside car station, hall station, lantern and lobby panel. The cleaning must be to a minimum of Elevator Industry Standards which is stated above and shall be to the full satisfaction of Owner. If Owner decides the cleaning level is below Owner's Standards, Owner has the option of bringing in another Contractor to perform the cleaning (with notice provided per

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Section 1.16 of the Contract). All costs of the cleaning by another Contractors plus the cost of supervision by Owner shall be paid by the Contractor that is performing the Preventive Maintenance under this Contract.

C. Obsolescence: Obsolescence is defined as a replacement part not being available for purchase by the Contractor. Contractor shall provide written documentation the replacement part is not available and that the Contractor has exhausted all research in obtaining such replacement parts. Such research would be the review of all firms as listed in the latest edition of Elevator World-"The Source". All local supply firms, including other Elevator Contractors must also be researched for availability of replacement parts. If the replacement part is not available, Owner shall pay the cost for such replacement part as the difference in cost of the new part as compared to the existing part at time of last purchase. Contractor shall provide all documentation of the replacement costs. All labor to install the new replacement part is included in this Contract and future replacement is included in this Contract at no extra cost to Owner. If Contractor installs a replacement part different than the original equipment, the new replacement shall not be of the "proprietary" type and the Contractor shall provide, in writing, the manufacture, type and model of the proposed replacement part.

#### **1.08 GENERAL CONDITIONS**

- A. All maintenance performed by Contractor shall be based upon the performance specifications of individual equipment as published by the equipment manufacturer or as otherwise indicated herein.
- B. Contractor shall comply with approved Elevator Equipment Industry Safety Standards. Contractor shall provide a copy of their Safety Program to Elevator Consultant and Owner within 5 calendar days after award of contract.
- C. In performance of this Contract, Contractor agrees to carry out all Work in strict compliance with all laws, Codes, rules and regulations set forth with regard to the equipment by Municipal, State and Federal authorities having jurisdiction in effect on the Contract commencement date over the Work or any part thereof.
- D. Contractor shall provide Owner, within 5 calendar days from the start of this Contract and prior to commencement of work, Safety Data Sheets for products Contractor intends to employ under this Contract. It shall remain the responsibility of Contractor to inform and train Contractor's employees on the use of the SDS requirements. All SDS documents shall be sent to Owner. Failure to furnish all such documentation, within the time schedule, shall be construed as terms by which to immediately terminate this Contract.
- E. Contractor shall protect all building equipment, surfaces, etc. from damage and shall perform repairs/replacement of any damaged items to "as existing" condition at their own expense and to the entire satisfaction of Owner. Contractor agrees to accept

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responsibility for all damage to equipment due to neglect of their personnel in the maintenance of equipment identified in this Contract. Therefore, Contractor, in cooperation with the Owner's authorized representatives, will make every effort to eliminate damage or disruption of building occupants while performing work.

- F. Contractor agrees that all labor furnished by Contractor shall be trained journeyman level mechanics and apprentices, thoroughly skilled in elevator Preventive Maintenance and directly employed and supervised by Contractor. They will use all reasonable care to maintain the equipment in a proper and safe operating condition at all times. Contractor shall enforce strict discipline and order among their employees while on Owner's premises and shall be subject to the rules and regulations established by Owner. The Owner reserves the right to request Contractor to replace any or all employees assigned to its building if it deems they are not performing in a satisfactory manner, or who refuse to comply with Owner's policies and guidelines.
- G. Contractor's field personnel shall wear clean, neat, well-maintained uniforms identifying them as employees of Contractor for ease of identification by Owner.
- H. Contractor shall provide Owner with the names of Service Technicians that will be assigned to the project within five (5) business days after award of contract. List shall be upgraded and brought current each time Service Technicians change routes or assignments. If there is a change in the service technician assigned to Owner, Contractor's supervisory staff must notify Owner prior to the replacement technician's first visit to building.
- I. Contractor shall provide a back-up personnel list within five (5) business days after award of contract for each of their employees assigned to Owner's account in the event of their illness, disability, vacation, leave, or absence for any reason. Said back-up personnel are expected to cover all duties and responsibilities of Contractor's regular personnel with no disruption in service. Owner and Elevator Consultant shall be informed prior to back-up personnel being used.
- J. Contractor shall be required to provide a member of their supervisory personnel, regularly engaged in inspection and supervision, to visit the building at least quarterly to observe the quality of maintenance and to make certain that the quality of maintenance meets the specified and intended standards. The Supervisor shall schedule each visit with Owner. Owner shall provide a member of their staff to accompany the Contractor during the on-site inspection of the elevator machine room, elevator cab. Inspections by the Contractor shall be at no cost to Owner. The Contractor shall provide a written report of the results of this inspection to the Owner's Agent within fourteen (14) calendar days of the on-site inspection.
- K. Contact shall be made with Owner upon Contractor's arrival and upon completion of service or any time Contractor's personnel leave the site. Contractor shall maintain a key to machine room and a parts storage area secured in a lock box in an area

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designated by Owner. This key may not be removed from the premises. The Owner will not check any keys out to Contractor's personnel.

- L. Contractor shall be solely responsible for:
  - 1. All means, methods, techniques, sequences, and procedures of the Work at no extra cost to Owner.
  - 2. Keeping all "Work Areas" clean and using all available means to recycle or reclaim materials.
- M. Contractor shall provide a written procedure of their "Lock Out-Tag Out" to Owner within 5 days of contract award and before starting work under this Contract.

## **1.09 MAINTENANCE CONTROL PROGRAM (MCP)**

- A. Provide an MCP for the equipment. The MCP shall include, but is not limited to the following:
  - 1. Examinations, maintenance, and tests of equipment at scheduled intervals in order to ensure that the installation conforms to the requirements of ASME A17.1/CSA B44 Section 8.6. The maintenance procedures and intervals shall be based on:
    - a. equipment age, condition, and accumulated wear
    - b. design and inherent quality of the equipment
    - c. usage
    - d. environmental conditions
    - e. improved technology
    - f. the manufacturer's recommendations for any SIL rated devices or circuits.
    - g. Cleaning, lubricating, and adjusting applicable components at regular intervals and repairing or replacing all worn or defective components where necessary to maintain the installation in compliance with the requirements of ASME A17.1/CSA B44 Section 8.6.
      - 1) The instructions for locating the Maintenance Control Program shall be provided in or on the controller along with instructions on how to report any corrective action that might be necessary to Owner.
      - 2) The maintenance records required shall be kept at a central location agreeable and accessible to Owner and the Contractor's elevator personnel.
- B. The Maintenance Control Program shall be Located in the elevator machine rooms and shall be in full document compliance with ASME A17.1/CSA B44 Section 8.6.
  - 1. Procedures for tests, periodic inspections, maintenance, replacements, adjustments, and repairs for all SIL rated E/E/PES electrical protective devices and circuits shall be incorporated into and made part of the Maintenance Control Program.
  - 2. Where unique or product-specific procedures or methods are required to inspect or test equipment, such procedures or methods shall be included in the Maintenance Control Program.

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- 3. The documents shall be filled out in full and completely maintained and updated by Elevator contractor providing service.
- 4. Maintenance check task lists shall be scheduled so that each month has the correct amount of tasks to complete and coincides with Part One 1.20 Paragraph E, and Part Two Table 2.01 of this specification.
- 5. Annual and semiannual maintenance tasks simply listed and scheduled so that they are completed in a lump sum visit are not acceptable. they must be conformed into a monthly PM visits and equally scheduled out to coincide with Part One 1.20 Paragraph E, and Part Two Table 2.01 of this specification.

## **1.10 SERVICE REQUIREMENTS**

- A. Complete Maintenance: Contractor agrees to examine regularly and systematically, clean, lubricate, adjust and provide unlimited callback service and repair and replace all components of the equipment included under these specifications in accordance with industry standards in a proper workmanlike manner to the entire satisfaction of Owner.
- B. Contractor shall repair loose cab handrails and maintain fastening bolt tightness, repair and maintain communication equipment installed by Contractor and communication equipment cabinetry doors and door hinges.
- C. Contractor shall include the following elements in the Preventive Maintenance Procedures for the Elevator:
  - 1. Provide once a month operational checks of all elevator car door safety edges/detectors. Contractor shall provide documentation of such checking in their machine room check charts.
  - 2. Provide once a month check of directional lights, call registered lights and all other elevator lighting fixtures. Furnish and replace all burned out bulbs.
  - 3. Maintain pit lighting, car top lighting and hoistway lighting.
  - 4. Contractor shall notify Owner before any equipment is removed from service. Contractor shall notify Owner when such equipment is placed back in normal service. The schedule for provision of service by Contractor shall vary according to the frequency as stated in this Contract. Contractor is expected to work closely with Owner and/or any firm authorized by Owner to arrange specific service times that are most beneficial to Owner.
  - 5. Contractor shall maintain hoistway, pit, machinery, elevator machine room, and any assigned Contractor's Work space in a clean, orderly condition, free of dirt, dust, oil and grease spills, trash and debris, at all times.
  - 6. Contractor shall be sensitive to Owner needs during their Work activity and create no excessive noise. Work that will generate excessive noise shall be scheduled with Owner.
  - 7. Contractor shall maintain three (3) complete sets of wiring diagrams showing "as built" conditions with any changes or modifications to circuits resulting from control modifications, parts replacement or equipment up-grade. One set shall

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remain in each machine room, one set shall be maintained in the Contractor's office and the third set shall be maintained in Owner's offices. When any modifications are made to diagrams, three copies of the modified drawings must be made. One copy shall be furnished to Owner to update their copy of the appropriate drawing. A copy shall be used to update the Contractor's office drawings and the original changes shall be maintained in the equipment machine rooms. Owner retains sole possession of these wiring diagrams. Wiring diagrams shall be kept in a neat and orderly fashion in the machine room.

- 8. Contractor shall be responsible for maintaining exterior of the machinery, and other parts of the equipment, properly painted, identified, and presentable at all times.
- 9. Contractor shall provide a lockable metal parts cabinet in the elevator machine room. Contractor shall coordinate installation with Owner.
- 10. Contractor shall conduct monthly evaluations of equipment performance, including car speed, door operations, riding quality and car leveling. Following such evaluations, the Contractor shall perform adjustment, repairs and replacements required to maintain manufacturer's operating performance. A copy of evaluations will be left with Owner and reviewed with them on request.
- 11. Contractor shall provide a qualified management representative to serve as Project Manager. Project Manager shall meet with Owner at such times as may be requested to discuss job details and concerns and/or any other matters concerning this Contract, or the Work to be performed herein, to assure amicable and successful execution of this Contract. The Project Manager shall be authorized to render any reasonable decisions to Owner without unnecessary delay.
- 12. Contractor shall maintain at all times the original elevator contract speed in feet per minute. Perform all adjustments required to maintain the proper door opening and closing time, within limits of applicable codes. Check the operating system for each unit to ensure that unit is kept operating continuously and make necessary tests and corrections to ensure all circuits are correct and time settings are properly adjusted.
- 13. Contractor shall maintain the following minimum elevator performance requirements.
  - a. Speed:
    - +/- 3% in both directions under all loading conditions for all geared/gearless elevators.
    - 2) +/-10% in both directions under all loading conditions for hydraulic elevators.
  - b. Door closing time:
    - 1) Measured from start of door closing until the hoistway doors are fully closed, will be the minimum permitted by Code.

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- c. Door dwell time:
  - 1) As permitted by The Americans with Disability Act, as now or hereafter amended.
- d. Floor leveling accuracy:
  - 1) As required by Code.
- 14. In accomplishing the above requirements, Contractor shall maintain a comfortable elevator ride with smooth acceleration, retardation and a soft stop. Door operation shall be quiet and positive with smooth checking at the extremes of travel.
- 15. Any additional work required to be performed pursuant to Federal, State or Local Code amendments subsequent to the date of this Agreement, or tests required to be performed which are not currently within the scope of this Agreement, will be performed by Contractor only upon receipt of a written change order from Owner.
- 16. Contractor shall provide to Owner, appropriate service manuals, adjusting manuals and technical manuals for all equipment.
- 17. All records and documents pertaining to the equipment provided to Contractor by Owner shall be kept current and in good condition and shall be returned to Owner upon demand or upon termination of this Contract.

## 1.11 TESTING

- A. Contractor shall conduct the following tests, and any other tests required by City of Boise, Federal and any other Governing or Code Agency that are in effect at the date of signing this Contract. Services shall include, but not be limited to:
  - 1. Contractor shall provide quarterly inspections and testing of the Firefighter's Service-Phase I and Phase II and standby power operation, if installed as required by AHJ. Any additional cost to complete the above inspections and testing on overtime shall be the responsibility of Contractor. Contractor shall maintain an up-to-date log of Firefighter's Service testing in the machine rooms and submit the results to Owner's authorized representative on a quarterly basis. Firefighter's Service testing shall be entered and recorded on a form supplied by Contractor and/or as required by the City of Boise, or both.
  - 2. Provide all testing as required by the State of Idaho Elevator Inspector and required by the ASME A17.1 Safety Code for Elevators and Escalators during normal working hours of the elevator industry.
- B. Contractor shall annually check the dispatching systems and make necessary tests and adjustments to insure that all circuits and time settings are properly adjusted, and all systems are performing as designed and installed. Contractor shall submit an annual written report of these results to Owner.
- C. Contractor shall audit the equipment once per year. An annual report from the audit will be provided to Owner by the last business day of the first year under contract. The report will include recommendations for improvements and estimates of cost for labor

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and materials to complete the suggested improvements. Owner's equipment will be audited for:

- 1. Code Compliance. Evaluate current Code compliance of all equipment. Monitor industry and Code developments and provide Owner with warning of anticipated Code changes to take effect during the fiscal year following the audit report. Recommend corrections, which should be made in the fiscal year following the audit report.
- 2. Equipment Performance. Audit performance of all equipment against its original parameters or specifications. Recommend corrections, which should be made in the fiscal year following the audit report.
- 3. Equipment Aesthetics. Audit the physical condition and appearance of the equipment visible to users and recommend upgrades, which should be considered to keep the equipment appealing to users and current with building standards for colors and decoration schemes.
- 4. Written reports of said tests shall be submitted to Owner within five (5) calendar days of actual testing.
- 5. Owner shall receive seven (7) days prior written notification of all tests so that an authorized representative of Owner may witness said tests. Safety precautions are understood to be of highest priority. Care will be taken to safeguard all surrounding building property during the testing. If during the testing, the actual testing fails the prescribed testing procedures in the ASME A17.1 and re-testing is required, the Contractor shall pay all costs of Owner's representative to witness such testing.

## 1.12 CHARTS-LOGS-INSPECTIONS

- A. Contractor shall post the Contractor's standard Preventive Maintenance Schedule/Chart and a Work Log in the elevator machine room and designated area. The Work Log shall include all entries for routine and non-routine maintenance and repairs, including supervisor's surveys. Entries shall include date Work is complete, mechanic or supervisor's name, brief description of Work completed, and the approximate time required for the Work. The Work Log and Preventive Maintenance Schedule/Chart shall be maintained for Owner's inspection at any time. Owner may copy the Work Log and Preventive Maintenance Schedule/Chart at any time. The log book will be made available to the Contractor at all times, including times when no designated Owner's personnel is/are present.
- B. Contractor shall provide Owner with a schedule, in either written or electronic form, (as preferred by Owner) of when equipment will be taken out of service for Preventive Maintenance. Owner must approve any changes to this schedule in writing.
- C. Contractor shall offer inspections of hoistway, pit equipment, car top, machine rooms and interiors to Owner upon completing scheduled Preventive Maintenance at no expense to Owner.

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## 1.13 DISPOSAL OF OILS/MATERIALS, ETC

- A. Contractor will be fully responsible for removal and disposal of all oils, greases, solvents and soiled cleaning cloths/rags that are used in the repair, service and adjusting of all equipment. All material will be disposed of in accordance with all present or future City, State and Federal Laws and Regulations, which may be applicable.
- B. When work is performed, the Contractor shall insure that all areas are clean and salvaged materials or scraps are removed before leaving jobsite. If Contractor fails to do so, Owner may perform necessary clean up actions and shall invoice the Contractor for all costs.

## **1.14 EXTENT OF COVERAGE**

- A. Contractor shall prepare and submit to Owner a detailed preventive maintenance schedule for all equipment to be serviced within five (5) calendar days after execution of the Contract. As a minimum, the equipment shall be examined and maintained in accordance with the following frequency:
  - 1. Minimum Service Frequency
    - a. Refer to Part Two Equipment to be Maintained.
  - 2. Extent of Coverage Geared Elevator: Contractor shall:
    - a. Regularly and systematically examine, adjust, clean, lubricate as required, and if conditions warrant, repair or replace:
      - 1) Geared hoist machine-including brake-armature-fields-brushes-brush rigging-gear case-gears-all bearings-hoist motor-sheave.
      - 2) Hoist and governor ropes.
      - 3) Governor.
      - 4) Governor pit sheave.
      - 5) Controllers, selector, starters, drives, dispatcher and relay panels.
      - 6) All bearings.
      - 7) All rotating elements.
      - 8) Contacts, relays and timers.
      - 9) Resistors and transformers.
      - 10) Solid-state devices and all sub-components including batteries and backup batteries.
      - 11) In-car emergency lighting.
      - 12) Traveling cables.
      - 13) Firefighter's service equipment.
      - 14) Automatic power door operators, landing and car door hangers, landing and car door contacts, door protective devices, hoistway door interlocks, bottom door guides.
      - 15) Interlocks and door closures.
      - 16) Car buffers.

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- 17) Car exhaust fan.
- 18) Car-top inspection station.
- 19) Limit and slowdown switches.
- 20) Door protective devices and alarm bells.
- 21) Car and corridor operating pushbuttons.
- 22) Load weighing equipment.
- 23) All hall lanterns, car position and hall position indicators, lobby control panels, car operating panels, and all other signal and accessory facilities furnished and installed as a part of the whole equipment.
- 24) Car and counterweight roller / slide guides.
- 25) Compensation, ropes, chains, and guides.
- 26) Hoist Ropes: tensioning, and proper lubrication.
- b. Furnish lubricants and all cleaning supplies.

## **1.15 EXCLUSIONS**

- A. The following items of equipment, hoistway and machine room enclosure are not included in this contract unless damaged by the Contractor.
  - 1. Contractor shall not be responsible for the following items and shall receive compensation for repairing such items. Rates as specified in the Contract:
    - a. Door knocked off the tracks/broken gibs.
    - b. Elevator left on independent, fire, attendant or emergency service.
    - c. Elevator call buttons broken, burned or jammed.
    - d. Car door detector out of adjustment from doors being hit.
    - e. Elevator turned off inside the car and the door pulled shut, unless there is an actual elevator problem that is included in their Contract.
    - f. Escalator balustrades, skirt panels, decks, wedge guards, and surface mounted lighting.
  - 2. Contractor shall not be responsible for repairs and replacement pertaining to the car enclosure, including removable panels, door panels, car doors, suspended ceilings, handrails, car finish and flooring coverings, hoistway enclosures, hoistway entrance frames, sills, emergency telephone instruments, signal fixture faceplates, fire recall initiation devices or cleaning of car interior.
  - 3. Contractor shall not be responsible for replacement of mainline and auxiliary disconnect switches, fuses and feeders to control panels. All above-ground elevator related electrical conduit and wiring are included in the Contract.
  - 4. Contractor shall not be responsible for repairs required because of negligence, accident or misuse of the equipment by anyone other than Contractor, their employees, Subcontractors, and agents.
  - 5. Owner agrees to maintain the elevator pit and machine room free from water and from unauthorized use.

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6. Contractor shall not be obligated to make other safety tests or install new attachments, whether or not recommended or directed by insurance companies, or by federal, state, municipal, or other governmental or non-governmental authorities unless requested to do so by Owner. In that event, Contractor shall proceed to perform the tests or work, and shall be reimbursed at the rates as stated in the Contract in Section 1.20 D Hours of Work. Contractor shall advise Owner, however, whenever such tests or attachments are recommended or required. Contractor shall not be required to make renewals or repairs necessitated by the negligence, misuse or obsolescence of the equipment or any other cause beyond its control except ordinary wear and tear unless such renewals or repairs are caused by Contractor's negligence or misuse in performing or failure to perform pursuant to this Agreement.

## 1.16 INSPECTION OF EQUIPMENT AND FEES

- A. Owner reserves the right to make such inspections and tests whenever necessary, at their expense, or at the expense of the Contractor if any provisions of this Contract have not been adhered to by Contractor, when deemed necessary to ascertain that the requirements of these specifications are being fulfilled. Owner will promptly notify Contractor in writing of the deficiencies identified. Contractor shall resolve all deficiencies at Contractor's total expense within fifteen (15) calendar days of written notification.
- B. Non code required Elevator Inspection fees shall be paid by Owner. Owner shall notify Contractor, in writing, of items required to be completed, which are the responsibility of Contractor. Contractor shall correct all immediately. Fees for re-inspection due to failure to eliminate deficiencies included in this Contract and the responsibility of Contractor shall be paid by Contractor. Contractor shall submit, in writing, a Work schedule of items to be completed by Contractor within seven (7) calendar days of notification of Owner. Contractor shall notify Owner, in writing of all items corrected. Owner shall notify State of Idaho Elevator Inspector, in writing, of items completed with copy of report to Contractor.

#### **1.17 CANCELLATION TERMS**

A. If Contractor fails to perform the work required by the terms of this contract in a diligent and satisfactory manner, Owner may after fifteen (15) calendar days written notice to Contractor perform or cause to be performed all or and part of the work required hereunder. Contractor agrees they shall reimburse Owner for any expense incurred therefore or Owner, at its election, may deduct the amount from any sum owed or to be owed Contractor under this contract. The waiver by Owner of a breach of any provision of these specifications by Contractor shall not operate or be construed as a waiver of any subsequent breach by Contractor.

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- B. If Contractor violates any of the provisions of this contract or fails to properly provide the services required by this contract, Owner shall advise Contractor of specific deficiencies and shall allow fifteen (15) calendar days to correct these deficiencies to Owner's total satisfaction. Owner may cancel this Contract with thirty (30) days written notice to Contractor if any of the provisions of this Contract are not completed by Contractor to the full satisfaction of Owner.
- C. The Owner may terminate this agreement immediately if the Elevator Contractor performs in the following actions /procedures:
  - 1. Any act or omission which creates a safety hazard to any person using any elevator.
  - 2. Any lapse in elevator operation of any elevator in excess of fourteen (14) calendar days except for "Scheduled Repairs".
  - 3. Failure of the Elevator Contractor's employees to be properly licensed by the State of Idaho.
  - 4. Improper use of the Owner's property/building.
  - 5. Violation of any applicable statute, ordinance, rule, law, code or regulation in regard to the Contract Documents.
  - 6. Receipt of two concurrent unacceptable safety inspections, except discrepancies noted as Owner's responsibility, from the Idaho Inspection Department pertaining to the elevator equipment included in this agreement.
  - 7. An elevator callback ratio in excess of one (1) callback, per elevator, per month over a four month period.
- D. If Owner chooses to modernize any of the equipment, that equipment may be eliminated from this Contract with thirty (30) days written notice to Contractor by Owner.

## **1.18 REQUESTS FOR SERVICE**

- A. Contractor shall provide 24-hour/7-days a week answering service. Contractor shall provide a list of Contractor's Branch Manager, Service and Repair Superintendent's cellular phone numbers for emergency contact in the event the answering service is ineffective. Management list shall be submitted to Owner within five (5) working days of the Contract start date.
- B. Contractor shall respond to all phone messages from Owner within fifteen (15) minutes of receipt.
- C. Emphasis shall be placed on keeping the equipment operating during the day. Removal of equipment from service for scheduled maintenance shall be scheduled with Owner.
- D. No repair shall be performed outside the scope of this Contract without prior approval from Owner.

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- E. Overtime work required or when requested shall be scheduled with the Owner in advance. The hourly rates for this Owner authorized overtime work shall be the difference between the normal an overtime hourly rates stipulated in Section 1.20 D "Hours of Work".
- F. If any equipment is shut down for more than twenty four (24) continuous hours after notification of a failure (except for pre-scheduled or major equipment repairs) the monthly unit billing shall be suspended until the individual equipment is restored to service.
- G. In the event the equipment fails to operate properly, Owner will notify Contractor by telephone and request immediate repair. For this purpose, Contractor shall maintain, at all times, office facilities, a twenty-four (24) hour telephone service and personnel to promptly dispatch competent mechanics to repair any reported equipment failure.
- H. If a safety or potential safety problem exists, Contractor shall immediately correct the problem. Written notification of corrective measures undertaken shall be provided to Owner, in writing, within one (1) business day.
- I. In case of an elevator accident, Contractor shall be notified immediately by Owner. The unit shall not be placed into operation until an investigation is performed by Owner's Representative and Idaho Elevator Inspector. Contractor shall provide a written report to Owner stating the condition of the unit before the Contractor leaves Owner's facility. The unit will not be placed in operation until an investigation is performed by Owner's Representative and/or the Idaho Elevator Inspector if the following conditions occur:
  - 1. A person has been injured and requires first aid treatment.
  - 2. The unit is not safe to place in normal operating service because of obvious mechanical and/or electrical condition.
  - 3. There is a concern by the Contractor or Owner as to the possible continued malfunction if placed in service.
- J. When corrective action is found to be the responsibility of the Contractor, the Contractor shall proceed immediately to make replacements, repairs, and corrections. If Contractor fails to perform the Work required by the terms of the Contract in a diligent and satisfactory manner, Owner may, after five (5) calendar days written notice to Contractor, perform or cause to be performed all or part of the Work required thereunder. Contractor shall reimburse Owner for any expense incurred therefore or Owner, at its election, may deduct the amount from any sum owed or to be owed Contractor. When such Work is determined not to be the Contractor's responsibility, a written report, including a cost estimate to remedy the deficiency, signed by the Contractor, shall be delivered to Owner by 3:00 p.m. the next business day for further action by Owner. If the Owner elects to have the Contractor perform these services, they will issue a separate Purchase Order Request beforehand. If a safety problem is noted, which is not within the Contractor's area of responsibility or expertise, written notice of such problem shall immediately be furnished to Owner by the Contractor.

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- K. No allowances shall be made to Contractor for extra costs as a result of difficulties encountered during any Work. All materials incorporated in the Work shall become the property of Owner upon material/parts installation.
- L. Contractor will, upon request, assist Owner with written recommendations to improve service and reduce call backs. Contractor shall provide the "Call back Log Form" to the Owner within seven (7) calendar days after the end of the previous month. Preventive Maintenance tickets will be separated for Work completed. The intent of this summary is to minimize callbacks by keeping the Contractor and Owner aware of callback trends. Contractor shall review Preventive Maintenance duties and callback trends with Owner on a monthly basis. Contractor shall provide Owner, on a monthly basis, copies of all time tickets for "all" work performed during the preceding month, if requested by Owner.
- M. Downtime notification is required according to the following schedule:
  - 1. Emergency Shut Down. Owner is to be notified immediately by phone, cell phone, pager or radio of emergency repairs or safety issues at time of detection. At minimum, a voice-mail message is required.
  - 2. Short Shut Down. Owner is to be informed in writing (e-mail acceptable) three (3) days in advance when equipment will be taken down for two (2) hours to eight (8) hours for non-emergency service/repair/upgrade.
  - 3. Major Shut Down. Owner is to be informed in writing (e-mail acceptable) one (1) week in advance when an unit will be taken down for more than one (1) day for non-emergency service/repair/upgrade.
- N. Contractor shall immediately shut down and remove the equipment from service when it appears to Contractor to be unsafe or operating in a manner which might cause injury to anyone using said equipment. Contractor shall provide Owner written notice of such action immediately, stating the reason the equipment was placed out of service and corrective measures required to place the equipment in service. Written notice shall be provided by Contractor before Contractor's personnel leave the jobsite.
- O. "Emergency Service Requests" Response Time is counted from the end of the phone call requesting repair to when the technician arrives at location. Contractor shall respond to all "Emergency Service Requests" in accordance with the following standards:
  - 1. Weekdays between 8 am to 5 pm: = 30 minutes.
  - 2. All other days/hours: = 60 minutes.
  - 3. "Emergency Service Requests" shall be resolved as quickly and effectively as possible and in such a manner that the disruption of equipment service and inconvenience to users is absolutely minimized.
  - 4. Contractor shall mobilize all necessary resources, including labor, equipment, tools, parts and materials as required to complete work required under these requirements.

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- P. Contractor shall provide unlimited "Routine Service Request" at no additional cost to Owner. "Routine Service Requests" Response Time is counted from the end of the phone call requesting repair to when the technician arrives at location. A "Routine Service Request" is any request not deemed by Owner to require immediate response and resolution by Contractor. "Routine Service Requests" shall include the following:
  - 1. Weekdays between 8 am to 5 pm: = 60 minutes.
  - 2. All other days/hours: = 90 minutes.
  - 3. "Routine Service Requests" shall be resolved as quickly and effectively as possible and in such a manner that the disruption of equipment service and inconvenience to users is absolutely minimized.
  - 4. Contractor shall mobilize all necessary resources, including labor, equipment, tools, parts and materials as required to complete the work required under these requirements.
- Q. Remote Monitoring: Any and all remote monitoring equipment and on-going monthly service shall be at the Contractor's total expense.
- R. Contractor shall assign an elevator Mechanic to assist with emergency generator tests at no additional cost to Owner.

## **1.19 WORK TICKETS**

- A. After each service/trouble call and regularly scheduled maintenance, a legible Work ticket will be completed indicating the date of work, work performed, parts replaced, total hours on the job and the Service Technician performing the Work. In the case of an equipment shutdown or repair, the Work ticket will describe the cause of the equipment failure and the action taken to correct the failure. Each month, Contractor shall provide a written callback report showing cause and correction of each month's callback(s).
- B. Each month a Report shall be sent to Owner and/or their representative, a copy of all Time Tickets, Callback Logs, Extra Billing, Test Reports, and Repairs required, that includes all items as described in Section 1.14 A. 2 "Requests for Service". Reports shall be received no later than the first Tuesday following the end of the month.
- C. All Work Tickets shall be left with Owner after all visits. Preventive Maintenance tickets shall be separated for work completed. Copies of Work Tickets shall be included in any invoice other than the monthly preventive maintenance contract amount invoice.
- D. Contractor shall provide, if requested by Owner and/or a company designated by Owner, quarterly, by the 10th day of the month following the quarter, copies of the three previous monthly "Check Charts". Report shall contain, but shall not be limited to, the following information:
  - 1. Dates and times of inspection and/or service.
  - 2. Names of persons performing inspection and/or service.
  - 3. Location and description of equipment being inspected and/or service.

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- 4. Condition of equipment.
- 5. Inspection/service performed.

## **1.20 HOURS OF WORK**

- A. All Work to be performed, not included in this Contract, will be authorized by Owner by written notification to Contractor prior to commencement of the Work. All vandalism work required shall not be completed/provided by the normal Contractors Service person(s) on-site for performing Preventive Maintenance unless authorized by Owner. Contractor may be required to provide additional Mechanics and Apprentices for extra work required.
- В.
- C. Twenty-four (24) hours a day, seven (7) days a week callbacks are included in the Maintenance Contract, at no additional cost to the Owner.
- D. All Work to be performed, not included in this Contract, will be authorized by Owner by written notification to Contractor prior to commencement of the Work.
  - 1. The maximum hourly rates shall be as follows:

Idaho	Mechanic	Helper
Straight Time	\$246.04	\$209.89
Straight Time x 1.7	\$299.92	\$252.94
Straight Time x 2	\$323.01	\$271.41

- 2. The material markup shall be 15% above true cost to Elevator Contractor.
- E. Preventive Maintenance Hours:
  - 1. Contractor shall provide minimum, Mechanic hours on-site, per Month, performing Preventive Maintenance, including those requirements of the Maintenance Control Program (MCP). Refer to "Part Two Schedule of Equipment" for required minimum hours and frequency of preventive maintenance.
  - 2. The stated hours in the Schedule of Equipment, per Month, shall be the minimum hours performing the Preventive Maintenance duties, including those requirements of the Maintenance Control Program (MCP). If equipment in this Contract requires additional maintenance for safe and reliable operation, Elevator Contractor shall perform the required maintenance. These hours do not include callbacks, repairs, travel time, adjustments or testing. Documentation of hours is required for monthly payment due Contractor. If less than the stated minimum hours of Preventive Maintenance are performed per month the prorated dollar value for the time short will be deducted from that month's invoice.
  - 3. Hourly dollar value for the Preventive Maintenance Hours is: \$300.00.

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- F. Contractor shall pay for all cost's, including travel time and mileage, of any regular time and overtime callback if the following conditions occur:
  - 1. If the equipment is running on arrival (ROA) when Contractor arrives on-site, and it was verified by Owner that the equipment was either not in operation or in a state of not operating correctly.

## 1.21 PRICE ADJUSTMENT AND CONTRACT AMOUNT

- A. The Contract stated monthly prices shall be subject to annual adjustment at the end of each one (1) year term and shall be limited to a maximum increase of 4 % per year. The monthly prices are as stated on the Bid Form and shall not be subject to further increase.
- B. The price adjustment on the stated hourly rates for work not included in the scope of this contract shall be limited to a maximum of 4% per year based on the percent change of the elevator mechanics base wage (increase or decrease) in the locality where the equipment covered by this Contract is maintained as determined by the International Union of Elevator Constructors. Contractor shall provide method of arriving at price adjustment to Owner.
- C. Sixty (60) days advance notification of price adjustments shall be submitted to Owner.

## **1.22 CONTRACT TERM**

A. The term of Preventive Maintenance shall be for a Two (2) year period starting at the end of the one-year warranty elevator preventive maintenance period. The Owner may, at its election, renew this Contract for an additional Two (2) year period or a year to year period, with sixty (60) days written notice to the Contractor before the termination date. If no notice is given at the end of the Two-year term, this Contract shall continue on a month-to-month basis, subject to cancellation by either party upon sixty (60) days written notice.

## **1.23 CONFIDENTIAL INFORMATION**

- A. Neither Contractor, nor Contractor's agents, employees, or Subcontractors, shall disclose to any person or entity any of Owner confidential information, whether written or oral, which Contractor or Contractor's agents, employees, or Subcontractors may obtain from Owner, or otherwise discover in the performance of this Contract. The term "Confidential Information" shall include, without limitation;
  - 1. The terms of this Contract are confidential and, except as otherwise required by law, Owner and Contractor shall not disclose the terms or existence of this Contract to any party without prior written consent.
  - 2. All information or data concerning or related to Owner, including the improvement, development or general business operations.
  - 3. Contractor shall not copy, disperse, or in any way disclose, any of Owner's information to any person(s) or company, unless such information has been given,

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in writing, to such person by Owner and Owner does not consider such information as confidential.

- 4. All printed information that is the property of Owner.
- 5. All Owner property.
- B. Contractor shall maintain all confidential information in strict confidence. Contractor shall take all reasonable steps to ensure that no unauthorized person or entity has access to confidential information, and that all authorized persons having access to confidential information refrain from any unauthorized disclosure. Without limiting or otherwise affecting the relationship of the Parties to this Contract, Owner may require each of Contractor's employees performing Work to sign a Nondisclosure Agreement.
- C. The provision of this shall not apply to any information that:
  - 1. Is rightfully known to Contractor prior to disclosure by Owner.
  - 2. Is rightfully obtained by Contractor from any third party.
  - 3. Is made available by Owner to the public without restriction.
  - 4. Is disclosed by Contractor with the prior written permission of Owner.
  - 5. Is independently developed by Contractor without the use or benefit of the confidential information provided by Owner.

## **1.24 EXAMINATION OF RECORDS**

A. Owner shall have the right to examine or audit any directly pertinent books, documents, papers and records of Contractor involving transactions related to this Contract for one (1) year after expiration of this Contract. Audits will be limited to the documentation and service records required to be provided to Owner as stated in this contract.

#### **1.25 INSURANCE**

- A. The liability of Contractor shall be limited to the work performed under these agreements. Contractor shall not be responsible for the acts and/or for the negligence attributable to the Owner, or to any other party not subordinated to Contractor.
- B. The Contractor shall take out and maintain during the life of this Contract, Workmen's Compensation with statutory limits set by the State of Idaho, temporary disability, prepaid medical and other similar employee benefit insurance as may be required by law or the Contract Documents.
- C. The Contractor shall carry a Commercial General Liability policy including completed operations, or letter from insurance carrier that completed operations is not excluded from policy, contractual, and property damage in a casualty or liability insurance company acceptable to the Owner; which insurance shall fully protect the Contractor and any Subcontractor performing the work covered by this contract, the Owner, the Agent, and Elevator Consultant from all loss and liability.
- D. The Contractor shall not commence work under this Contract until it has obtained all insurance required hereunder. The Contractor shall provide and maintain, until the work

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covered in this Contract is completed and accepted by the Owner, the Agent and Elevator Consultant, minimum insurance coverage as follows. No limits apply on a per policy aggregate:

TYPE OF COVERAGE	LIMITS OF LIABILITY
WORKMEN'S COMPENSATION	STATUTORY
EMPLOYER'S LIABILITY	\$1,000,000 BODILY INJURY BY
	ACCIDENT, EACH ACCIDENT
	\$1,000,000 BODILY INJURY BY DISEASE,
	POLICY LIMIT
	\$1,000,000 BODILY INJURY BY DISEASE,
	EACH EMPLOYEE
COMMERCIAL GENERAL LIABILITY	\$1,000,000 EACH OCCURRENCE
including COMPLETED OPERATIONS	BODILY INJURY & PROPERTY DAMAGE
	\$1,000,000 PERSONAL & ADVERTISING
	INJURY
	\$2,000,000 GENERAL AGGREGATE
	\$2,000,000 PRODUCTS COMPLETED
	OPERATIONS AGGREGATE
	\$5,000 MEDICAL EXPENSE
BUSINESS AUTOMOBILE LIABILITY	\$2,000,000 COMBINED SINGLE LIMIT
	(EACH ACCIDENT)
UMBRELLA LIABILITY	\$5,000,000 PER OCCURRENCE
	\$5,000,000 AGGREGATE

- E. The Contractor shall file with the Owner prior to the commencement of its work, signed Accord Certificates of Insurance from their insurance company, stating that such insurance is being carried and that the coverage afforded thereunder shall not be reduced, modified, cancelled or not renewed, nor restrictive modifications added thereto, until at least thirty (30) days prior written notice shall have been given to Owner . All insurance must be maintained for one (1) year after Work completion.
- F. The Owner shall be named as additional insureds under the Contractor's general liability policy or policies which shall expressly provide that the interest of the additional insured shall not be affected by any breach by Contractor of any policy provision for which such certificates evidence coverage. Additional insured is defended and indemnified for actions arising from Contractor's acts, omissions or neglects, but is not defended or indemnified for its own acts, omissions, neglects or bare allegations. The policy for commercial general liability shall be endorsed utilizing additional insured forms CG 2010 07 04 and CG 2037 0704 by Insurance Services Office, Inc. or a form that covers the additional insureds through the completed operations period, or letter showing that completed operations is not excluded from the insurance policy. Such general liability policy or policies shall be endorsed to specifically insure the Work and shall be considered primary and non-contributory over any insurance policies

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which may be obtained by Owner and any additional insured. Any insurance that is obtained by the Owner or any additional insureds that may respond to a claim will be in excess over the Contractor's liability, and the Owner or any additional insureds' insurance will not contribute to the loss.

- G. The business automobile policy shall include coverage for all owned, leased, hired and non-owned automobiles.
- H. Contractor's umbrella liability shall be at least following form excess over the commercial general liability, business automobile liability and employer's liability.
- I. All insurance to be maintained by Contractor and Subcontractors pursuant to this Contract shall be at the Contractor's and Subcontractor's sole expense, and in the event Contractor or Subcontractors fail to obtain or maintain any insurance required herein, Owner may purchase coverage and charge the expense thereof to the Contractor or terminate this Contract after fifteen (15) days written notice and allowance for cure to Contractor. Owner has the right to withhold any and all payments from Contractor if the insurance requirements are not fully complied with and satisfied.
- J. The insurance requirements in regard to types or limits or acceptance of Certificates of Insurance by the Owner shall in no way limit or relieve the Contractor of its responsibilities under this Contract or at law including, without limitation, the Contractor's indemnification obligations and liability in excess of the limits of the coverage required. Owner makes no representation that the minimum limits of liability specified under the terms of this Contract are adequate to protect the Contractor against Contractor's undertaking of this contract. In the event the Contractor believes that the insurance coverage called for under this Contract is insufficient, the Contractor shall provide at its own expense such additional insurance as the Contractor deems adequate and necessary. In the event the Contractor maintains higher limits, the Contractor's liability and obligation to defend, indemnify, and hold harmless Owner and any additional insureds shall not be limited to the minimum limits of liability required to be carried by the Contractor as outlined in this Contract.
- K. Coverage shall be written on an a per policy basis and shall be maintained without interruption from the date of commencement of Contractor's work until the date of final payment and with respect to Contractor's completed operations coverage, until the expiration of the statute of repose.
- L. Contractor shall not subcontract any Work without prior written notice to Owner. Any Subcontractor shall be required to procure and maintain in force the same insurance as required of the Contractor in the Contract Documents.

#### **1.26 INDEMNIFICATION**

A. To the fullest extent permitted by applicable law, Contractor ("Indemnitor") shall and does agree to indemnify, protect, defend and hold harmless Owner and Owner's directors, officers, employees, agents, and consultants (collectively 'Indemnitee" or

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"Indemnified Parties") from and against all claims, damages, losses, liens, causes of action, suits, judgments and expenses, including attorney's fees, of any nature, kind or description (collectively "Indemnified Claims") arising out of, caused by, or resulting from the Work or any part thereof; but only to the extent such indemnified claims is caused by any negligent acts or omission or misconduct of the Indemnitor, anyone directly or indirectly employed by it or anyone for whose acts it may be liable. The indemnification to be provided here under shall not be limited by a limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefits acts or other benefit acts. In no event shall Contractor be liable for consequential damages.

- B. The indemnity contained herein shall not be deemed a waiver of or in limitation of any other rights the Owner may have.
- C. In the case of third-party claims, the Indemnitee(s) shall give the Indemnitor written notice with respect to any Indemnified Claims asserted by a third party, as soon as possible upon the receipt of information of any possible Indemnified Claim or of the commencement of such Claim. The Indemnitor may assume the defense of any such Claim, at its sole cost and expense, with counsel designated by the Indemnitor and to the Indemnitee(s). The Indemnitee(s) may, however, select separate counsel if both Indemnitor and Indemnitee are defendants in the Indemnified Claim and such defense or other form of participation is not reasonably available to the Indemnitee(s) due to conflicts of interest, or any other reason. The Indemnitor shall pay the reasonable attorneys' fees incurred by such separate counsel until such time as the need for separate counsel expires. The Indemnitee may also, at the sole cost and expense of the Indemnitor fails to assume the defense of the Indemnified Claim unless it has obtained the prior written consent of the other Party, which consent shall not be unreasonably withheld or delayed.
- D. Indemnitor shall pay to the Indemnitees on demand, as incurred or at any time thereafter, all costs and expenses including reasonable attorneys' fees incurred by the Indemnitees in enforcing any of the aforesaid indemnification obligations and covenants, and any other provision or covenants of this Contract.
- E. Such aforesaid indemnification obligations shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any Indemnitee. It is agreed that with respect to any legal limitations now or hereafter in effect and affecting the validity and enforceability of the indemnification obligations in this Contract, such legal limitations are made a part of the indemnification obligations to the minimum extent necessary to bring the indemnification obligations herein into conformity with the requirements of such limitations, and as so modified, the indemnification obligations herein shall continue in full force and effect

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## 1.27 COSTS AND ATTORNEYS FEES

A. Unless otherwise governed by the indemnification rights and obligations of this Contract, in the event either party fails to perform its duties or obligations under this Contract, or if either party breaches the terms and conditions of this Contract, the prevailing party of any Contract dispute shall be awarded its reasonable costs and attorney fees associated therewith.

## **1.28 APPLICABLE LAW**

A. The Contract shall be construed, interpreted, and governed by the laws and regulation of the State of Idaho.

# 1.29 CONTRACTORS EMPLOYEES' SAFETY AND ACCIDENT PREVENTION PROGRAM

- A. Contractor shall submit, for review, to Owner, the Contractors Employees' Safety and Accident Prevention Program. Document shall be updated when any changes in the Program are adopted by Contractor.
- B. Contractor shall verify, in writing, that all Contractors personnel that perform any work under this Contract have completed the Contractors required training under this Safety and Accident Prevention Program and that the Employee shall receive additional on-going and future training under the Contractor's Safety and Accident Prevention Program.

## **1.30 NO DISCRIMINATION**

A. Contractor will not discriminate against any employee or applicant for employment by Contractor because of race, creed, color, age, sex, marital status or national origin. Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, sex, marital status or national origin. Contractor agrees to post in conspicuous places notices setting forth the provisions of this Section.

# PART TWO - EQUIPMENT TO BE MAINTAINED

# 1.31 ELEVATOR (#4) EXISTING ELEVATOR

MAKE	DESIGNATION	TYPE OF CONVEYANCE	CAPACITY	RATE OF SPEED	MINIMUM MONTHLY PM HOURS
TKE	Elevator #4	State	3,500	200	1.5

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# PART THREE - REPLACEMENT PARTS INVENTORY

## 2.01 MATERIALS

- A. Contractor shall maintain an inventory level of spare parts on-site which will permit prompt repair or replacement of components that fail or become worn. The equipment shall not be left shut down more than four (4) hours because of spare (replacement) parts not on-site.
- B. Contractor shall mark and identify all lubricating oils and cleaning solvents that are stored on-site. All storage cans shall be Code approved. All unmarked cans shall be removed from the Owner's premises. Machine room shall not be used for storage of materials or items that do not pertain to the maintenance of the Owner's equipment.
- C. In performing the Work indicated in these specifications, Contractor agrees to provide only manufacturer approved parts used by the manufacturers of the equipment for replacement or repair, and to use only those lubricants obtained from and/or recommended by the manufacturer of the equipment. If Contractor wishes to provide parts or lubricants other than recommended by the Manufacturer, Contractor shall, in writing, state the type proposed and the lubrication specifications to the Owner for review and written approval. These replacement parts shall not be considered an upgrade of equipment and shall be provided by Contractor at no additional cost to the Owner.
- D. Contractor shall procure replacements parts in the most expeditious manner available.
- E. Parts requiring repair shall be rebuilt to an "as new" condition.
- F. Contractor shall maintain on site and/or at their local office, at all times, a sufficient amount of replacement parts, by the original manufacturer, to maintain the equipment in first-class and safe operating condition, at all times.

## 2.02 MICROPROCESSORS

- A. Contractor shall maintain, in stock, available for immediate usage, an inventory of replacement parts for any microprocessor/solid state equipment used for each system. This includes all solid-state boards located in the machine room, fixture stations, car tops or any other location.
- B. Contractor's service technicians shall carry diagnostic equipment designed to analyze programming and microprocessor functions and malfunctions on all equipment.
- C. Contractor shall pay for all costs if the original manufacturer must be brought on-site to re-program the system or be required to place the equipment in service.

# END OF FULL SERVICE PREVENTIVE MAINTENANCE CONTRACT

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#### SECTION 14 21 00 GEARLESS TRACTION ELEVATOR MODERNIZATION

#### PART 1 - GENERAL

#### **1.01 SECTION INCLUDES**

- A. Work required to complete the Elevator Modernization of One (1) TKE MRL passenger elevators # 4 at Myrtle Street Garage Bodo 8.
- B. Basis of Design is based on TKE Standard Issis Elevator Modernization Package with some added requirements as specified .

#### **1.02 RELATED REQUIREMENTS NOT INCLUDED IN ELEVATOR SCOPE**

- A. All demolition of existing systems being removed or replaced as part of this modernization.
- B. Provide all engineering, material, and labor to install elevator machine room air conditioning. Temperature range shall comply with elevator manufactures range and humidity factor. Seal off any Penetrations caused by removal of old systems.
- C. Remove all sprinklers completely from Machine room and Hoistways. Per current NFPA 13.
- D. Provide adequately sized mainline power feeders for the new elevator equipment as required by the Elevator Contractor.
- E. Provide new Mainline disconnects must have adequate size dedicated ground directly to building ground.
- F. Disconnect shall have auxiliary contacts to accommodate battery lowering feature.
- G. Provide all engineering, calculations and stickers to comply with NFPA 70 620.16
- H. Provide additional lighting in the elevator machine room to maintain a minimum of 200 lx (19 FTC) at floor level. Position of additional fixtures is to be determined after the new elevator equipment is located in the elevator machine room. (Ref. ASME A17.1-2016/CSA B44-10). Convert all existing lighting to LED.
- I. Provide two (2) additional 20A GFCI duplex receptacles in the elevator machine rooms. (Ref. NFPA 70; Art 620.23).
- J. Provide a means to lock electrical circuit breaker in the open position for the car lighting circuit, intercom circuit, seismic switch, monitoring system. Overcurrent protection for these circuits shall be located in elevator machine room on a common panel (ref. NFPA 70; Art. 620.53 & 620.55). Provide 3 additional circuits for future use.
- K. Provide a minimum 15# ABC fire extinguisher on a metal bracket located in the elevator machine room adjacent to the lock side of the machine room door. Ok to retain existing.
- L. Provide all engineering, software and components to bring Fire life safety systems compliant to NFPA 72.

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- M. Provide pit lighting to comply with Code (min. 100 lx [19-fc]) and provide the necessary light switch that will turn on all pit light fixtures. Light switch to be adjacent to the top area of each elevator pit ladder. (Ref. NFPA-70; Art 620.24).
- N. Provide a 20A GFCI duplex receptacle in elevator pit. (Ref. NFPA-70; Art 620.24). See Electrical Specifications and Drawings.
- O. Provide all electrical wiring, including EMT and an electrical ground, from the existing main line disconnect switch to each new elevator controller.
- P. Provide dedicated telephone line to controller terminal. This will be furnished by Owner . Existing phone line may be retained if exists.
- Q. Provide Cat 5 network hub in elevator machine room. System shall be connected to building network and operational.
- R. Lighting in all Enclosed Elevator Lobbies is required to be not less than 100 lx (10 fc) of illumination at floor level in front of the elevator doors with the doors in the closed position. Provide all lighting fixtures to comply with Code.
- S. Elevator Machine rooms must be completely walled in with the proper fire rating and all area fire taped or caulked.
- T. Paint and seal machine room floors with light gray epoxy concrete sealer just prior to substantial completion.
- U. Paint and seal all elevator pit floors and walls light gray epoxy concrete sealer just prior to substantial completion.
- V. All major cutting and patching for new components to include fire caulking in penetrations.
- W. Remove and seal off all hoistway venting with a fire rated system to match 2 hr fire rating of hoistway.
- X. Traffic planning, Signage, and routing for pedestrians during construction.
- Y. Provide adequate lay down areas for tools and equipment storage. Coordinate with owner
- Z. Provide floor and wall protection in surrounding work areas and access routes.
- AA.Provide 8' tall barricades of adequate size to completely enclose elevator entrances of elevators being modernized with lockable 3'x7' entrance doors to keep pedestrians out of elevator work zones.
- BB. Test all sump pumps in pits if exists to ensure they are operating properly.

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## **1.03 ELEVATOR SCOPE**

A. Provide controller/selector, electrical wiring in machine room/car/hoistway, counterweight derailment device, , Seismic requirements for drive sheave, traveling cables and governor rope, , hoist ropes, hoist machine motor, deflector sheaves, brake, AC motor, car door operator, car top inspection station, hoistway interlocks/tracks/hangers/door gibs, Hoistway doors, car doors, cab interior finishes to

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include ceilings, intercoms, ASME A17.1-2016/CSA B44-10 Firefighters' Service, Seismic requirements, requirements of The Americans with Disability Act (ADA) and other elevator components as listed in this Elevator Specification.

- B. Retain existing car capacity, and door size. Retain existing car speeds.
- C. Elevator Contractors shall review ASME A17.1-2016/CSA B44-10 8.7.2.9 Machinery and Sheaves Beams, Supports and Foundations and 8.7.2.17.4 Verify via a structural engineer all existing supports sheave beams and foundations/ floors slabs are adequate to accommodate new equipment being installed.
- D. Provide labor and material to install new equipment in existing machine room.
- E. Existing elevator equipment that is being retained/reused shall be placed in first class operating condition by Elevator Contractor at no extra cost to Owner.
- F. Components not being replaced, or Value engineered out of scope shall be covered under Warranty and full maintenance agreement after Modernization is complete. Obsolescence claims will not be accepted.
- G. Elevator Contractor, and sub-contractors are responsible for all, Permits, Codes and Tests:
- H. Equipment and Elevator Modernization work shall comply with requirements of the Elevator Safety Code, and other applicable Codes/Rules/Regulations of State of Idaho.
- I. File necessary plans, prepare documents, and obtain necessary approval of governmental departments having jurisdiction and required certificates of inspection for work (AHJ), in accordance with the Elevator Specification.
- J. Elevator Contractor is not relieved from furnishing and installing work shown or specified which may be beyond requirements of ordinances, laws, regulations and codes.
- K. Perform tests required by Elevator Consulting Services Inc., AHJ and/or the ASME A17.1 with procedures described in ASME A17.2 Guide for the Inspection of Elevators, Escalators, and Moving Walks, in the presence of State of Idaho Elevator Inspector and Elevator Consulting Services Inc., and other required tests for equipment/material installed under this Specification.
- L. Supply personnel and equipment for tests and final inspections. Cost of such testing and inspections shall be included in the Contract Sum.
- M. Cutting and Patching
  - 1. Repairs shall be made as necessary to complete the Elevator Modernization in original condition, including all major, and minor cutting, chipping fitting and drilling of masonry, concrete, metal and other materials as specified or required for proper assembly, fabrication, installation and completion of Work under the Contract, and including any patching and redecorating as may be necessary. This includes work in the elevator machine room, hoistway, pit, counterweight, car, guide rails brackets/fastenings, lobby hall station and other areas of the Elevator Modernization.

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- 2. Hoistway sides of the hall station boxes shall be sealed.
- N. Welding
  - 1. Welding shall comply with ASME A17.1-2016/CSA B44-10. Design for welding, repair, cutting or splicing of members upon which the support of the car, counterweight shall be prepared by a licensed professional engineer.
  - 2. Welding shall be by welders qualified in accordance with the requirements of Section 5 of ANSI/AWS D1.1.
  - At the option of Elevator Contractor, the welders may be qualified by one of the following: (a) the manufacturer contractor. (b) A professional consulting engineer. (c) A recognized testing laboratory.
  - 4. Elevator Contractor shall furnish required documentation to Elevator Consulting Services Inc., before starting the Elevator Modernization.

# **1.04 EXISTING CONDITIONS**

- A. Elevator contractor and subcontractors are responsible for doing a detailed survey of all equipment and existing conditions prior to Bid. Any discrepancies in electrical, structural, mechanical or specified components specified shall be brought to the attention of the owner, and owners representative prior to bid in the form of a written RFI.
- B. All, or any existing conditions or discrepancies identified after bids (excluding hidden issues) shall not warrant a change order or change to contractual schedule.
- C. Elevator contractor and subcontractors are responsible for performing all field measurements and engineering on all added or replaced components to achieve proper fit and finish of the elevator modernization. Owner shall not be responsible for any additional costs or delays due to missed existing conditions or improper Prebid survey measurements.

# 1.05 REFERENCE STANDARDS

- A. Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- B. AHJ local Laws, Codes, Requirements and Regulations.
- C. ASME A17.1-2016/CSA B44-10; Safety Code for Elevators and Escalators, with Idaho Addendums including Part XXIV Elevator Safety Requirements for Seismic Risk Zone 2 or Greater. (Also stated in these specifications as Elevator Safety Code)
- D. ASME A17.2.1; Inspectors Manual for Elevators and Escalators. (Current adopted edition)
- E. ASME A17.3 Safety Code for Existing Elevators and Escalators. (Current adopted edition)
- F. NFPA 70 National Electrical Code. (Current adopted edition)
- G. NFPA 72- National Fire Alarm Code. (Current adopted edition)
- H. NFPA 13 National Sprinkler Code. (Current adopted edition)
- I. International Building Code (Current adopted edition).

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# **1.06 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination
  - 1. Coordinate work with other subcontractors to provide necessary conduits and devices for proper installation of wiring, including but not limited to the following:
    - a. Elevator equipment devices remote from elevator machine room ,or hoistway.
    - b. Remote group automatic panel in lobby from controller cabinet.
    - c. Telephone service for machine room.
    - d. Network service for machine room.
    - e. Elevator pit lighting, sump pump, hoistway lighting, and overhead lighting if required.
    - f. Automatic transfer switches. From controller cabinet.
  - 2. Coordinate work with other subcontractors for equipment provisions necessary for proper elevator operation, including but not limited to the following:
    - a. Overcurrent protection devices, proper procedures, and conditions, and coordinate with related work.
  - 3. Preinstallation Meeting: Convene meeting at least one week prior to start of this work.
    - a. Review schedule for installation, proper procedures and conditions, and coordinate with related work.

# 1.07 SUBMITTALS, DRAWINGS, DIAGRAMS, AND OTHER DATA

- A. See Administrative Requirements for submittal procedures.
- B. Designers Qualification Statement.
- C. Manufactures Qualification Statement.
- D. Installers Qualification Statement.
- E. Drawings:
  - 1. Provide elevator machine room showing location of machinery, controls, and transformers in machine room.
  - 2. The elevator equipment is to be arranged in a neat and workman-like manner so that elevator equipment is readily accessible for repairs, adjusting and preventive maintenance.
  - 3. Car and hall station fixtures.
  - 4. Submit layout drawings as required by the AHJ. Submittals to the AHJ shall have information pertinent to the Elevator Modernization to determine whether the Elevator Modernization complies with applicable Codes including State of Idaho elevator codes.
  - 5. Provide all engineering and engineering stamps as required by local AHJ.
- F. Component Cut Sheets. Elevator Contractor shall provide catalog cuts sheets for furnished and installed material and equipment.
  - 1. Controller and Isolation Transformer
  - 2. Landing system

- 3. AC Hoist Motor
- 4. Governor
- 5. Hoist ropes
- 6. Governor rope
- 7. Compensation
- 8. Shackles
- 9. Safeties
- 10. Roller or slide guides car and counterweight
- 11. Cab Finishes
- 12. Car top Inspect station
- 13. Door operator and clutch
- 14. Gibs
- 15. AC system
- 16. Mainline disconnects
- 17. Electrical Sub Panel
- 18. Fire safety devices and components being replaced.
- 19. Complete information on motor, electrical services, controls, and other coordination information.
- 20. Voltage Confirmation and complete information on Motor, electrical services, controls, and other coordination information.
- G. Elevator contractor shall remain responsible for all accurate dimensions, proper fit, ensuring installed elevator equipment complies with these specifications.
- H. Close out Documents
  - 1. Provide "As Built and Installed" wireman's original pull sheets showing raceway, junction box, traveling cable wire nomenclature and origination and termination locations.
  - 2. Furnish one complete electronic versions Operation and Maintenance Manuals covering the stipulated mechanical systems and equipment. The manual shall comply with requirements indicated in the Project Closeout section of the Specifications.
- I. O&M Manual shall be complete for equipment furnished and installed, controls, accessories and appurtenances stipulated. Include as a minimum the following:
  - 1. Parts list, with manufacturers' names and catalog numbers. Lists shall be complete for the materials installed.
  - 2. Serial number of equipment furnished and installed.
  - 3. Service organizations and sources of replacement parts with company names, addresses, and fax and telephone numbers.
- J. MCP Maintenance Control Plan located in elevator machine room shall contain all newly updated data and all code required documentation, instructions, maintenance task checklists, Rope monitoring, and testing records.
  - 1. MCP shall also contain all unique job specific testing instructions and procedures.

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#### **1.08 DEFINITIONS**

- A. Where "as shows", "as indicated", "as detailed" or words of similar meaning are used, it shall be understood that reference to the Specifications are made unless otherwise stated. Where "as directed", "as required", "as authorized", "as reviewed", "as accepted" or words of similar meaning are used, it shall be understood that the direction, requirement, permission, authorization, review or acceptance of Elevator Consulting Services Inc., is intended, unless otherwise stated.
- B. When used in the Contract Documents, "provide" shall be understood to mean "provide complete, furnish and install".
- C. Terms used are defined in Safety Code for Elevators and Escalators, ASME A17.1-2016/CSA B44-10. Any reference to Code in the technical sections shall refer to ASME A17.1-2016/CSA B44-10.
- D. Reference to a device or a part of the equipment applies to the number of devices or parts required to complete the installation.
- E. AHJ: Regulatory Authority Having Jurisdiction. (State of Idaho Elevator Department)
- F. ASME: American Society of Mechanical Engineers.
- G. NFPA: National Fire Protection Association.
- H. NRTL: Nationally Recognized Testing Laboratory.
- I. Owner: Capitol City Development Co
- J. Owners Representative: Elevator Consultant, or Architect.
- K. MCP: Maintenance Control Plan

### **1.09 INTERIM MAINTENANCE**

- A. Interim maintenance shall commence on elevator #4 upon Notification to proceed to the awarded elevator contractor.
- B. Interim maintenance shall reflect the same requirements, and characteristics as specification section 14 20 00.
- C. Elevators taken out of service for modernization shall not be part of any maintenance billing cycle.
- D. Interim maintenance shall remain in effect until substantial complete has been awarded by Architect and owner for all for pieces of equipment. Warranty period will begin after substantial completion.

#### **1.10 WARRANTY**

- A. Twelve (12) Month Period.
- B. Warranty maintenance shall reflect the same requirements, and characteristics as specification 14 20 00 in its entirety.
- C. Warranty period starts when elevator is substantial complete, and owner, owners Representatives have inspected, accepted, and has resumed use.

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- D. After warranty 12 month period ends elevator goes back on interim maintenance until all units are complete, and all warranty periods have expired.
- E. After all warranty periods have expired the new 5 year maintenance contract will begin.

# 1.11 MATERIAL AND EQUIPMENT

- A. Elevator contractor shall provide all transportation and handling.
- B. Materials, products and equipment shall be properly packaged and protected to prevent damage during transportation and handling.
- C. Storage, Protection and Removal of Non-Retained Equipment
  - 1. Provide secure suitable temporary weather-tight storage facilities as may be required for materials that may be damaged by storage in the open.
  - 2. If off-site storage of equipment is required, Elevator Contractor shall pay for costs incurred.
  - 3. Store and protect delivered materials from damage. Do not use damaged material in the Elevator Modernization.
- D. Elevator Contractor shall remove from Owner, all equipment that will not be retained and re-installed, complying with Federal, State, and City Laws/Codes/Regulations/Requirements. This includes, but not limited to, the following:
- E. Elevator contractor shall retain key components such as controller, controller boards, relays generator, governor, landing system key components, door operator, and any other components that may be used as spare parts on the remaining elevators not being modernized to minimize part malfunction issues on existing equipment.
- F. Manufacturers' Name Plates
  - 1. Manufacturers' data plates and other identifying markings shall not be affixed on exposed surfaces to public view.
  - 2. Each major component of mechanical and electrical equipment shall have on a securely attached plate the manufacturer's name, address, model number rating and any other information required by Governing Codes.
  - 3. This requirement does not apply to Nationally Recognized Testing Laboratories (NRTL) and Code required labels.
- G. Colors of Factory-Finished Equipment
  - 1. Colors will be selected from the manufacturer's standard color charts.
  - 2. Elevator Contractor shall submit samples of colors. Materials
  - 3. Steel:
    - a. Sheet Steel-Furniture Steel for Exposed Work: Stretcher-leveled, cold-rolled, commercial-quality carbon steel, complying with ASTM A366, matte finish.
    - b. Sheet Steel for Unexposed Work: Hot-rolled, commercial-quality carbon steel, pickled and oiled, complying with ASTM A569.
    - c. Structural Steel and Plates: ASTM A6, ASTM A36 AND ASTM A108.

- 4. Stainless Steel:
  - a. Type 302 or 304 complying with ASTM A167, with standard tempers and hardness required for fabrication, strength and durability.
  - b. Apply mechanical finish on fabricated Work in the locations shown or specified. Federal Standard and NAAMM nomenclature, with texture and reflectivity required matching sample. Protect with adhesive-paper covering until final inspection.
  - c. No. 4: Bright directional polish (satin finish). Graining directions as shown or, if not shown, in longest dimension.
  - d. Rimex-texture 5-SM-304 Stainless Steel. Thickness .032. Manufactured by Rimex Metals, Inc.-2850 Woodbridge Ave.-Edison, New Jersey, 08837. 732-549-3800.
- 5. Aluminum:
  - a. Extrusions per ASTM B221; sheet and plate per ASTM B209.

## **1.12 PROJECT CLOSEOUT**

- A. Final Cleaning
  - 1. Elevator hoistways shall be cleaned and free from rust, rubbish, loose plaster, mortar drippings, extraneous construction materials, dirt and dust on a daily basis.
  - 2. Care shall be taken by Elevator Contractor not to mark, soil, or otherwise deface existing surfaces. In the event that finished surfaces become defaced, clean and restore such surfaces to the original condition at the cost of Elevator Contractor.
  - 3. Clean areas in which painting and finishing work is to be performed just prior to the start of this Elevator Modernization and maintain these areas in a clean condition. Cleaning includes the removal of rubbish, broom cleaning of floors, the removal of any plaster, mortar, dust and other extraneous materials from finish surfaces, and surfaces that will remain visible after the Elevator Modernization is complete.
  - 4. Clean machine room equipment and floor of existing paint, dirt, oil and grease. Paint machine room floor with one (1) coat of epoxy type paint. Color to be light gray.
  - 5. Clean hoistway, car, entrances, operating, signal fixtures and elevator equipment of dirt, lint, oil, grease and finger marks.
  - 6. Cleaning During the Elevator Modernization
    - a. Project shall be cleaned on a daily basis by Elevator Contractor. Dust must be kept at a minimum at times, especially in the hoistways.
  - 7. Punch Listing; Final Observation and Review
    - a. Elevator Contractor shall complete the Elevator Modernization prior to requesting final inspection.
    - b. Elevator Consulting Services Inc. will attempt to schedule the final inspection during the same period the AHJ Elevator Inspector inspects the elevator. Provide Elevator Consulting Services Inc., with copies of the Elevator Inspectors Report within two (2) calendar days of the on-site Elevator

Inspectors visit. Provide a written report of items which have been corrected by Elevator Contractor.

c. If a second (2<sup>nd</sup>) follow-up inspection is required of Elevator Consulting Services Inc., or AHJ, Elevator Contractor shall pay costs for such inspections/surveys including expenses for both the Elevator Inspector and Elevator Consulting Services Inc., at our regular hourly billing rates.

## **1.13 ALTERATIONS**

- A. Description
  - 1. General: Perform alterations and related Work in accordance with requirements of Contract Documents.

# **1.14 PROTECTION**

- A. Provide, erect, and maintain lights, barriers, weather protection, warning signs, and other items as required for proper protection of building tenants, visitors and workers engaged in Elevator Modernization, either directly or indirectly for the Elevator Modernization.
- B. Provide and maintain temporary protection of the existing structure designated to remain where removal and new work is being completed, connections made, materials handled, or equipment moved.
- C. Take necessary precautions to prevent dust from rising by wetting removed masonry, concrete, plaster and similar debris. Protect unaltered portions of the existing building affected by the operations under this Section by dust-proof partitions and other adequate means.
- D. Provide adequate fire protection in accordance with AHJ Fire Department rules and requirements.
- E. Do not close or obstruct walkways, passageways or stairways. Do not store or place materials in passageways, stairs or other means of egress. Conduct operations with minimum traffic interference.
- F. Be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided. Elevator Contractor shall repair or replace any damaged building equipment that is damaged by Elevator Contractor.

# **1.15 QUALITY OF WORK**

- A. Perform removal and alteration Elevator Modernization as shown, with due care, including shoring, bracing, etc. Be responsible for damage, which may be caused by such Work, to any part or parts of existing structures or items designated for reuse. Perform patching restoration and new Work in accordance with the Contract Documents.
- B. Materials or items designated to be reinstalled, as stated in Section 14 21 00, shall be removed with care, under the supervision of Elevator Contractor and protected and stored until reinstalled. Replace any material or items damaged in its removal or reinstallation.

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- C. Materials or items removed and not designated to become the property of Owner shall be removed from the job site by Elevator Contractor.
- D. Execute the Elevator Modernization in a careful and orderly manner, with the least possible disturbance to Owner occupants.
- E. Where alterations occur, or new and old Work join, cut, remove, patch, repair or refinish the adjacent surfaces or so much thereof as is required by the involved conditions, and leave in the condition which existed prior to the commencing of the Elevator Modernization.
  - 1. Finish new and adjacent existing surfaces as specified for Elevator Modernization. Clean existing surfaces of dirt, grease, loose paint, etc. before refinishing. Where any existing equipment is to be re-used; repair/renovate such equipment to place it in perfect working order.
- F. Should Elevator Contractor discover any asbestos during the Elevator Modernization, Owner shall be notified for further action by Owner. This does not pertain to the hoistway doors or cab removal by Elevator Contractor.

# **1.16 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum of ten tears documented experience.
- B. Installer Qualifications: Company specializing in performing work of this type specified with at least Ten years of documented experience.
  - 1. Installers must be Licensed by the State of Washington and have been trained by NEIEP or CET elevator certification program.
- C. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1?D1.1M and no more than 12 months before start of scheduled work.
- D. Products Requiring Fire Resistive Rating: Listed and classified by ITS (DIR), UL (DIR), NRTL, or testing agency acceptable to AHJ.
- E. Products Requiring Electrical Connection: Listed and classified by UL (DIR) or testing agency acceptable to the AHJ.
- F. Elevator Contractor shall furnish special tools, meters, diagnostic tools/devices, troubleshooting special hand-held tools/devices, printed information, adjusting information and other special tools/devices to perform maintenance, testing, troubleshooting, repairing and adjusting, before starting the elevator project. No substitutions of proprietary circuit boards, EPROMS, hardware locks, software passwords or coding shall be allowed. Tools and software necessary to diagnose problems and/or change operational parameters of the elevator system shall be retained by Owner and shall function for the life of the installed equipment. Hardware and software required for diagnosis and operating parameter modification shall be products offered as standard by the manufacturer of the control system.

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G. Elevator Contractor shall provide the availability of any Elevator Maintenance Contractor or Owner to purchase and receive spare parts within seventy-two hours from date of parts order by Owner or Elevator Maintenance Contractor. Replacement and spare parts are defined as any and items required to maintain, test, service, repair, adjust and operate the elevator as designed and installed, in a safe and trouble free manner. Elevator Contractor shall sell any spare parts including proprietary parts to Owner, or an Elevator Maintenance Contractor employed by Owner, during the life cycle of the elevator equipment.

## PART 2 – PRODUCTS

# 2.01 MANUFACTURERS 3<sup>RD</sup> PARTY NON-PROPRIETARY

- A. TK Elevator
- B. Vantage Group
- C. Canton Nidec
- D. Minnesota Elevator
- E. All products must be purchased through one of the manufacturers listed above.

# 2.02 ELECTRIC TRACTION ELEVATORS

A. DESCRIPTION AND PERFORMANCE: Elevator Modernization will be in accordance with the following details and consist of the following: Modernize elevator #4 at Myrtle Street Garage building from Geared overhead traction elevators to Permanent Magnet AC Gearless elevators.

Control System Dispatch	Simplex Selective Collective	
Existing Manufacturer	ТКЕ	
Capacity Lbs.	3500	
Speed FPM	200	
New Machine Motor	New VVVF AC Motor on existing machine	
Machine Room Location	Bottom Terminal landing	
Owner ID	4	
Door Equipment	TKE	
Door Configuration	Single Speed Side Opening	
Clear Opening	3'-6" Wide X 7'-0" Tall	
Door Operation	Automatic Power Operated	
Landings	4	
Openings	4All Front	
Landing Designations	*1,2,3,4	
Voltage	480 VAC Contractor Verify	
Exiting Motor HP	40 Contractor Verify.	

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# 2.03 MACHINE ROOM EQUIPMENT

- A. Controllers: Provide new VVVF Non -regenerative drive. Controllers shall have on board user interface tool/display for adjusting and trouble shooting.
- B. Isolation Transformer: New elevator controllers shall be equipped with an isolation transformer located between the mainline disconnect and elevator controller.
  - 1. Provide isolation transformers plus proper filtering to eliminate both electrical and audible noise.
- C. Drive: The controller shall utilize a VVVF-AC solid state drive unit. The solid state power control shall be a closed feedback loop design. It shall be a compact self-contained unit that will provide step less acceleration and deceleration and provide regulation car speeds. Regenerative drive not required.
- D. The system shall provide the required electrical operation of the elevator control system including the automatic application of the brake, which shall bring the car to rest upon failure of power. In addition, the power control shall be arranged to continuously monitor the actual elevator speed signal from the tachometer and to compare it with the hoist motor armature voltage and the intended speed signal, to verify safe and proper operation of the elevator.
- E. Solid State Power Supply and Logic Control: Provide solid-state power devices with voltage and current capability ample to operate the elevator at the specified conditions.
- F. The maximum RMS Harmonic Distortion (THD) contribution to the building power distribution network, from the elevator drive and hoist system, shall be restricted for voltage (THDV) and current (ampere) (THDI). The RMS harmonic distortion is defined as the amount of harmonic distortion as a percentage of the RMS value of wave forms at frequencies (fundamental and harmonic). The following THD criteria are to be understood as RMS unless otherwise noted.
  - 1. THD will be measured and compared to the building THD. The building THD will be measured with the new elevator systems disconnected from the building power distribution system.
  - 2. The building THDV and THDI; with the elevator disconnected, will be measured at each elevator's feeder disconnecting means.
  - 3. The elevator THDV and THDI; will be measured at each elevator's feeder disconnecting means located in the elevator equipment room. Individual measurements will be taken with each elevator operating at full-rated load at contract speed in the up direction.
  - 4. The maximum allowable THDV and THDI will be the calculated difference between the building THDV and THDI measurements and the elevator THDV and THDI measurements respectively.
  - 5. Maximum allowable THDV from each elevator motor drive is three percent (3%) or the value of the building THDV measured in part by above, whichever is greater.

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- 6. Maximum allowable THDI from each elevator motor drive is fifteen percent (15%). No individual current harmonic shall exceed ten percent (10%) relative to the fundamental (THDI-F). THDI-F defines the amount of harmonic distortion as a percentage of the fundamental frequency current.
- G. Solid State Power Control:
  - 1. Provide a solid state power controller to operate the hoist motor, brake, and other electromechanical devices. The controller shall include interfacing pilot electromechanical devices as required for accepting the necessary elevator hoistway switches and operating switches.
  - 2. These include, as a minimum, terminal slowdown devices, over travel limit switches, solid state magnetic leveling switches, inspection operating pushbuttons, emergency stop switches and governor over-speed switches.
- H. Microprocessor Elevator Logic Control:
  - 1. The operation shall be accomplished utilizing microprocessor computer logic control. The elevator control program shall be contained in nonvolatile, programmable, read-only memory. The control shall be constructed such that future alterations in elevator operation including changes of operating parameters including but not limited to speed, acceleration, jerk, pre-opening, door speed, door dwell, floor counts for leveling, and car zoning may readily be made as part of normal maintenance and service. If a separate, detachable device is required, it shall be furnished.
  - 2. Safety circuits shall be monitored and controlled by the programmable logic control with redundant protection.
- I. The microprocessor elevator logic control shall be contained in a NEMA 1 cabinet.
- J. Fault Diagnosis:
  - 1. Capability shall be provided to diagnose faults to the level of individual circuit boards and individual discreet major components for both the Solid State Power Controller and the Elevator Logic Controller. (Capability to diagnose faults within an individual circuit board is not required.)
  - 2. If fault diagnosis requires a separate, detachable device, it shall be furnished to the owner at no additional cost.
- K. Hoist Machine/Deflector Sheave
  - 1. Retain existing basement mount geared machine located in pit.
  - 2. Provide new AC hoist machine motor to include velocity encoder and brake switch.
  - 3. Recondition Brake with new brake shoe linings and coil. Clean and lubricate all pivot pins. Adjust for smooth quiet operation.
  - 4. Provide new deflector sheaves that shall be installed in the elevator hoistway, car, and counterweight.
  - 5. Provide bevel washers for any bolt/nut that is installed in a plane of five (5) degrees or greater.

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- 6. Paint hoist machine with machinery enamel gray.
- L. Hoist Machine Support Beams:
  - 1. The existing hoist machine support beams may be retained. Clean beams. Do not cut or burn any holes in beams.
  - 2. Provide additional required support beams/brackets/structural steel, nuts/bolts/washers and bearing plates that may be required. Support shall be reviewed and approved by a licensed structural engineer.
- M. Car-Governor & Pit Sheave:
  - 1. Provide new governors and pit sheaves.
  - 2. Test governor and safeties as per Elevator safety code. Install metal test tags as required.
- N. Provide new governor rope.
  - 1. Provide rope data tag and guards as required by elevator safety code.
  - 2. Hoist Ropes & Shackles:
- O. Hoist Ropes
  - 1. Provide new hoist ropes on cars. Provide new wedge clamp shackles at both hitch plate ends.
  - 2. Equalize tension on hoist ropes.
  - 3. Provide elevator code required rope tags.
- P. Keys Required in Machine Room:
  - 1. Two (2) spare sets of keys to operate keyed switches and locks shall be furnished upon completion. Keys shall be properly marked with metal tags. Each tag shall include one-quarter inch letters or numbers as to the function of each key set. Each set shall be separated as a group.
  - 2. Provide one complete set of Group 1 keys and key box as required by elevator safety code.
  - 3. Keys shall be separated into groups as required by ASME A17.1-2016/CSA B44-10.
  - 4. Sign Required on Outside of Machine Room Access Gate:
    - a. Provide sign stating language as required by the AHJ Elevator Inspection Department. Letters shall be not less than three eights inch high. Sign shall be plastic or metal and securely fastened so as not to be readily removed without the use of special tools. Sign shall read : Elevator Equipment Room. Authorized Personnel Only.
- Q. Parts Cabinet:
  - 1. Provide one metal lockable type replacement parts cabinet per machine room.
  - 2. Parts cabinet size to be approximately 36 inches wide, 18 inches deep and 42 inches tall.
- R. Computer Display Terminal-Group Cars:
  - 1. A monitor and computer or Lap top shall be provided in each of the machine room.

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- 2. Job Configuration-This report shall provide a brief description of the system, including the job number, programmable job name, number of cars, number of landings, openings per landing for each car, programmable car designation, programmable landing designation, fire service options, serial communication port definitions and other system options.
- 3. System Performance Graph-This report shall provide elevator system performance data based on hall call waiting times. At the end of each hour, the quantity of up and down hall calls shall be tallied. Up and down average waiting times shall be calculated and saved in the controller's non-volatile RAM. This information shall be kept for a minimum of seven (7) days.
- 4. Hall Call Distribution-This report shall provide hourly call distribution in a tabulated format for each hour, showing the number of hall calls which were answered within 15 to 90 second intervals for each landing and direction, and show the percentage and number of cars that were in service during a specified time frame. This information is saved for, at least, twenty-four (24) hours.
- 5. Graph Display of Elevator Status-This report shall provide a graphic display of the elevator hoistway that gives the user a comprehensive picture of car locations, door status, direction of travel, car calls registered, hall call assignments, estimated time of arrival of a car for a registered hall call, wait time of a registered hall call, floor labels, system status and a car status window. A per-car status window shall be provided that shows the status of the car, such as automatic operation, inspection, firefighters' service; time out of service; top floor demand and bottom floor demand.
- 6. Entering Hall and Car Calls:
- 7. The computer terminal shall provide a means for entering hall and car calls using the arrow and enter keys. If the call is valid and registered, a corresponding symbol shall be displayed on the screen.
- 8. Real Time Clock:
- 9. The user shall be provided with the capability to program the controller's real-time clock.
- 10. Car Inputs and Outputs:
- 11. The monitor shall provide simultaneous viewing of most individual car input and output signals to detect important sequential events.
- 12. Special Event Calendar Menu:
- 13. The special-event calendar menu shall provide three options. The first display of Special Events Entries allows the user to examine the documented faults or events. The second, List and Description of Events, allows the user to examine the faults and events which are monitored. The third, Initialize the special-event Calendar, allows the user to clear the documented faults and events.

# 2.04 OPERATION CONTROL TYPE

- A. Operation Dispatch:
  - 1. Provide automatic selective collective "Simplex Operation".

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- 2. Include simplex automatic operation controls responsive to variations of traffic demand.
- 3. Provide system in car so that momentary pressure on one or more of the car buttons causes car to start moving in direction of registered call.
- 4. If a car stops for a landing call, and a car button matching the direction the car was traveling is pressed within a predetermined time interval after a landing stop, proceed in same direction regardless of other landing calls that are registered.
- 5. Hold car for a predetermined time interval at landings when stops are made to enable passengers to enter and leave car.
- 6. Program system to minimize delays caused by registration of car calls disproportionate to number of persons in car.
- 7. When car, without registered car calls, arrives at floor landing where both up and down calls are registered, initially respond to landing call in direction of travel.
  - a. If no car or landing call is registered for future travel in that direction, respond to landing call in opposite direction.
- 8. Operate landing or car riding lanterns to correspond with the next direction of travel, and when responding to landing call, operate landing lantern to match direction of call being answered.
- 9. Program door operating sequence to minimize car and landing door open and close time periods.
- B. Security:
  - 1. Furnish and provide the following:
  - 2. New controllers shall be furnished with card reader security programing, I/O boards and all affiliated software, hardware and lockouts for security. Security system shall apply to both car and hall security.
- C. Independent Service:
  - 1. Independent service operation shall be provided for the elevator through the actuation of a keyed switch located on the COP face and not in a service panel. This service will cancel any existing car and hall calls, and hold the doors open at the landing. The car will only respond to car calls. While on independent service the hall arrival lanterns shall be inoperative.
- D. Emergency Battery lowering
  - 1. Elevator shall be provided with Battery lowering Power. In the event of a power loos to building elevator will detect and lower to the next available landing, open doors to prevent entrapments.
- E. Hoist Machine Brake Electrical Device:
  - 1. Provide electrical controls that will "sense" when the hoist machine brake is "picked" during the start-up of the elevator to operate.
  - 2. If the brake electrical circuit is "not made" and is sending a signal to the elevator controller that the brake is not "picked" the elevator shall not leave the landing.

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- 3. After a predetermined time, the car shall attempt to start again. This operation shall attempt the start up at least three times. If, after that third time, system and the brake is not "picked" the elevator shall shut down.
- 4. In order to start the elevator after this cycle the main line disconnect or a manual switch in the controller must be turned to the off position and then to the on position for normal elevator service. This operation shall also be in effect during car top inspection mode.
- F. Load Weigher:
  - 1. The load weigh system shall consist of load sensors, amplifier and buffer board. The buffer output shall be connected to the machine room via two conventional wires. The output circuit shall be virtually impervious to damage from transients or accidental connection to voltages up to 120 vac.
  - 2. Adjusted devices shall be provided to allow hall call bypass from thirty percent (30%) to eighty percent (80%) of rated capacity.
  - 3. Ascending Car over speed and Unintended Car Movement Protection:
    - a. Elevator shall have secondary brake or multiple directional stopping device located in the system to prevent unintended movement and ascending car overspeed.
- G. Car Lighting and Fan:
  - 1. Provide means to turn off the car lights and fan when there is no car demand. Turn on the car lights and fan when there is a car demand for service. Car lights shall be turned on before the car/hoistway doors begin to open.
  - 2. Retain existing Fan.
- H. Seismic:
  - 1. Elevator shall be programed to operate per Elevator Safety Code requirements during a seismic event.

# 2.05 MACHINE ROOM, HOISTWAY, AND CAR ELECTRICAL

- A. Except as noted hereafter, existing equipment may be refurbished and retained if compatible with new operation and components. Provide any modification or addition necessary to comply with ASME A17.1 Code requirements/standards.
- B. Electrical Wiring and Wiring Connections:
  - 1. Electrical equipment and wiring shall conform to current NFPA 70-National Electrical Code requirements.
  - 2. For equipment with electrical components, provide NRTL label on each component for which published standards exist.
  - 3. The frames of motors, hoist machine, controller, transformer and the metal enclosures for electrical equipment in or on the car, hoistway and machine room shall be grounded in accordance with NEC-Article 250. Provide "daisy chain" electrical grounding for machine room electrical cabinets.
  - 4. Provide required and adequate electrical wiring gauge sizing and number of electrical conductors to eliminate any voltage/amperage drop/variation for the

machine room, hoistway switches/interlocks, and car operating fixtures/positions indicators/exhaust fan/car lighting/inspection station/leveling devices; hall stations/position indicators and other elevator electrical equipment.

- C. Conductors and Connections:
  - 1. Provide new wiring in machine room, hoistway and car. Copper throughout with individual wires coded and connections on identified studs or terminal blocks. Use no splices or similar connections in wiring except at terminal blocks, control cabinets, junction boxes.
  - 2. Provide ten percent (10%) spare wires in wiring runs. Separate and mark spare wires. Spare wire ends shall be turned back or protected against accidental grounding. Tag spare conductors indicating termination points at each end. Place a record of spare conductors in Adjuster's book.
- D. Conduit:
  - 1. Provide painted or galvanized steel conduit and duct. Conduit size, ½ inch minimum. Do not use flexible conduit exceeding 36 inches in length. Flexible low voltage heavy-duty service cord may be used between fixed car wiring and car door switches for door protection devices.
  - 2. Plastic wire ties shall not be allowed for conduit fastenings or support except flexible electrical cords to the car door detector control box.
  - 3. Any existing electrical gutter and conduit may be retained if such equipment complies with current ASME A17.1-2016/CSA B44-10 Safety Code for Elevators and Escalators and NEC Requirements.
- E. Traveling Cables:
  - 1. Provide new. Provide flame and moisture-resistant outer cover. Traveling cables shall terminate in the elevator machine room elevator controller and on the elevator car top junction box with marked terminals. Traveling cables that are terminating at the car top junction box shall be enclosed in EMT or Duct from the underside of the car to the car top junction box. Provide traveling cables holding/suspension device at half way vertical height in hoistway for traveling cable to have a perfect loop to the underside of the elevator car frame.
  - 2. Provide required Kellems Grips on traveling cables.
  - 3. Prevent traveling cables from rubbing or chafing against hoistway or elevator equipment within hoistway.
  - 4. Provide Two (2) Cat 5 conductors with network plugs attached at both ends in traveling cable.
  - 5. Provide ten percent (10%) spare conductors in each traveling cable.
  - 6. Provide an extra six (6) spare pair of shielded wires.
  - 7. Provide one (1) number 22 AWG Coax cables in a separate traveling cable.
  - 8. Provide an extra two (2) spare pair (total of 4 wires) of #14 conductors.
  - 9. Provide wiring for car lighting and exhaust fan.
  - 10. Provide shielded traveling cable conductors for in-car emergency communication device and intercoms to main floor security station and elevator machine room.

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11. Spare wire ends shall be turned back or protected against accidental grounding to any live electrical circuit or electrical ground. Tag spare conductors indicating termination points at each end. Place record of spare conductors in Adjuster's book.

# 2.06 HOISTWAY EQUIPMENT

- A. Hoistway Entrances:
  - 1. Existing entrances shall be retained. Clean foreign material from entrances.
    - a. Re-clad / Reskin all entrances , jambs and transoms at all landings to Stainless steel #4 finish.
  - 2. Braille plates
    - a. Provide new Braille plates on all landings that are being re-cladded / reskinned.
- B. Hoistway Door Panels:
  - 1. Retain existing hoistway door panels.
  - 2. Re-clad doors, jambs and transoms to Stainless steel #4 finish.
  - 3. Retain stainless steel finish on all landings that currently have stainless steel finishes.
  - 4. Provide new Gibs Two (2) per door.
  - 5. The bottom of doors shall be provided with metal brackets including removable phenol gibs which run in the sill slots with minimum clearance: one (1) at the leading edge and one (1) at the trailing edge. Fastening screws shall be Stainless Steel.
  - 6. Provide required retaining devices for hoistway doors.
  - 7. Provide a safety retainer plate between each of the two (2) standard gibs. The retainer plate shall comply with the requirements of A17.1 rule 110.11 h. Provide written documentation the Hoistway Door Fire Rating Labeling approves the safety retaining plates. When the doors are in the fully open position gibs shall be within the sill groove-no gib shall be outside the sill groove.
  - 8. Provide hoistway door unlocking device if missing. Drop Key Holes.
- C. Hoistway door tracks, Hangers, and Interlocks
  - 1. Door Interlocks:
    - a. Provide new door interlocks for each hoistway door entrance.
    - b. System shall be compatible with new linear type door operator and clutch.
    - c. Provide fire-rated wires from each interlock to hoistway electrical riser as required by NFPA 70. Conductors shall be flame-retardant and suitable for a temperature on not less than 392 degrees F. Conductors shall be Type SF or equivalent. Hoistway wiring shall be the Fire Rated electrical wires.
    - d. Provide green colored electrical ground wire from each interlock to the "elevator controller" to an electrical connection designated as an electrical ground by NFPA 70 requirements. Electrical grounding to electrical conduit (EMT) is not approved.

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- 2. Door Hangers:
  - a. New door hangers shall be Linear type system.
  - b. System shall be compatible with new linear type door operator and clutch.
  - c. Provide hoistway door hangers.
  - d. Hangers shall be adjustable and bolted into the top of the new hoistway doors.
  - e. Provide new hanger rollers and up thrust.
- 3. Door Tracks:
  - a. Retain clean and check all fastenings for tight and proper alignment.
  - b. System shall be compatible with new linear type door operator and clutch.
- 4. Door Headers & Struts:
  - a. Retain existing.
  - b. Clean all components' s and check and ensure all fastenings are tight.
- 5. Door Closers:
  - a. Provide a new closer at each entrance hoistway door.
- D. Hoistway Fascia, Dust Covers:
  - 1. Retain existing. Replace any missing or broken fastenings. Replace any fascia or dust cover that is missing, bent or damaged.
  - 2. Touch up paint only. Match existing color.
  - 3. Clean dust covers and fascia.
  - 4. Floor Numbers:
    - a. Paint four inch high floor numbers within the hoistway, as required by ASME A17.1/CSA B44.
    - b. Numbers shall be located to be visible within two inches opening of the car doors.
- E. Hoistway Sills:
  - 1. Retain existing sills. Check fastenings. Replace any damaged, broken or missing component.
- F. Car & Counterweight Guide Rails & Brackets:
  - 1. Retain existing car/counterweight guide rails and brackets. Check fastenings for tightness. Replace any missing or broken fastenings. Remove dirt, grease etc.
  - 2. Add steel blocking spacers to Counterweight frame between side channels and rails to minimize movement to <sup>1</sup>/<sub>2</sub>" during a seismic event.
  - 3. Paint car side of Counterweights safety yellow.
  - 4. Realign guide rails to within 1/16 inch vertical and 1/32 inch tram. File existing joints to provide a smooth guide rail fishplate joint. No disc sander shall be used in the filing of these joints.
  - 5. Clean guide rails and brackets. Paint rails and brackets from pit floor to first landing sill height with light gray rust prohibitive enamel paint. Exclude the rail blades.
  - 6. Provide bevel washers for any bolt/nut that is installed in a plane of five degrees or greater.

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- G. Car & Counterweight Buffers:
  - 1. Retain existing Buffers. Touch up paint only.
  - 2. Existing pit shall also be retained. Clean and paint with one coat light gray rust prohibitive enamel paint.
  - 3. Replace any missing or broken fastenings.
  - 4. Provide bevel washers for any bolt/nut that is installed in a plane of five degrees or greater.
- H. Pit Equipment
  - 1. Pit Stop Switch:
    - a. Provide new emergency stop switches in the pit located so as to be accessible from the hoistway access door and pit ladder.
    - b. Pit switch shall be of the maintaining type and marked to indicate the RUN and STOP positions.
- I. Limit Switches:
  - 1. Provide new normal and final terminal stopping devices at each terminal landing. The stopping devices shall have rollers having rubber or other approved composition to provide silent operation when activated.
- J. Car Sling:
  - 1. The existing car sling shall be retained. Check fastenings for tightness. Replace any missing or broken fastenings. Remove dirt and lint.
  - 2. Paint with one coat of rust resistant enamel paint to match existing.
  - 3. Provide bevel washers for any bolt/nut that is installed in a plane of five degrees or greater.
- K. Platform:
  - 1. The existing platform shall be retained. Clean components including underside of dirt and dust. Check fastenings. Replace any damaged bolts, washers and nuts.
  - 2. Provide bevel washers for any bolt/nut that is installed in a plane of five degrees or greater.
- L. Load Weighing:
  - 1. Load weighing shall be provided and set to determine when the car is at capacity load. The elevator will bypass hall calls when loaded to capacity. Provide adjustable switches that will allow bypass at selected car loads.
- M. Car Safeties:
  - 1. Retain and refurbish safeties.
  - 2. Clean safeties free of any dirt and debris. Ensure all components are free of dirt, are properly lubricated and properly adjusted.
  - 3. Replace worn shoes and or damaged components.
  - 4. Provide bevel washers for any bolt/nut that is installed in a plane of five degrees or greater.

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- N. Counterweight:
  - 1. Retain existing counterweight frame.
  - 2. Retain and refurbish safeties.
  - 3. Replace worn shoes and or damaged components.
  - 4. Clean safeties free of any dirt and debris. Ensure all components are free of dirt, are properly lubricated and properly adjusted.
  - 5. Add blocking to Counterweight sling to prevent no more than <sup>1</sup>/<sub>2</sub>" movement between the rails and the sling.
  - 6. Existing counterweight weights may be retained.
  - 7. Check correct counterweight overbalance. Add or remove required weights to achieve required weight for proper elevator operation. Notify Elevator Consulting Services Inc., in writing, of any weight removed or added and percent overbalance.
  - 8. Paint counterweight frame including weights with one coat of rust resistant enamel paint to match the existing color.
  - 9. Provide bevel washers for any bolt/nut that is installed in a plane of five degrees or greater.
- O. Counterweight Slide Guides
  - 1. Retain existing
  - 2. Provide new slide guide inserts and adjust to eliminate slop on rail.

# 2.07 CAR EQUIPMENT

- A. Car Door Equipment:
  - 1. Retain Car doors. Re-clad with Stainless Steel 5WL Finish.
- B. Door Protective Devices:
  - 1. The car doors shall be provided with a new detector unit that detects an object in the path of the closing doors at such a distance that reversal of the doors can be provided without physical contact with the doors.
  - 2. Nudging Action:
    - a. If door opening is obstructed for a predetermined time (20 30 seconds), an audible device will sound and the doors will attempt to close. Door closing shall not exceed 3.5 J (2-1/2 ft-lbf) kinetic energy. If the detector is continuously obstructed during closing, the doors will stop or stop and reopen. Allow door to close after obstruction is removed as permitted by ASME A17.1-2016/CSA B44-10. The nudging time shall be adjustable through a range of at least 10 to 60 seconds.
    - b. Differential Door Time: Adjust timers to enable varying time that doors remain open.
    - c. Car Call: Hold open time adjustable between 3 and 5 seconds.
    - d. Landing Call: Hold open time adjustable between 3 and 8 seconds. Use landing call timing when responding to coincidental calls.
    - e. Door Re-Open: Same as for Car Call.

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## Modernization

- C. Slide Guides:
  - 1. Retain existing Slide Guides.
  - 2. Provide new slide guide inserts.
  - 3. Provide bevel washers for any bolt/nut that is installed in a plane of five degrees or greater.
  - 4. Adjust slide guides to remove excessive slop on rails.
- D. Car Balancing:
  - 1. Car shall be static balanced. Roller guides shall have equal tension.
  - 2. If weights are required for correct balance of the car, the required weights shall be installed under the platform enclosed in a structural frame that is attached to the car sling/platform. Each weight shall be secured to prevent a movement during elevator travel and testing.
- E. Car Top Protective Rail:
  - 1. Provide a Top rail, Intermediate Rails and Toe Board on the rear and two (2) sides of the car top. The back and two side rails shall extend the length of the car top except where prevented by top of car operating equipment.
    - a. Top Rail to be located at a vertical height of forty two inches above the car top. Resist a force of 200 lbf in a lateral or downward direction.
    - b. Intermediate Rail to be located centered between the Top Rail and the car top. Resist a force of 150 lbf in a lateral or downward direction.
    - c. Toe Board to be four inches high above the car top. Resist a force of 50 lbf in a lateral direction.
- F. Elevator Main Car Operating Panel:
  - 1. Provide new low profile surface mount Car operating Panel. Finish Stainless Steel #4.
  - 2. New Car operating panels shall conform to ADA requirements.
  - 3. Install in-car to lobby intercom as part of the elevator car station.
  - 4. Provide car position indicator, two inch high digital red digital type together with directional arrows located in the top area of car operating station.
  - 5. Voice enunciator:
    - a. Voice enunciator shall be integral to Car operating panels and shall announce when elevators have arrived at all floors.
  - 6. Provide a "Door Open Hold" key switch that when placed to the Hold position will allow the doors to remain open for an extended period of time. Engrave in one quarter inch letters under key switch "Door Open Hold". Engrave above key switch "OFF" to the left and "ON" to the right. Key shall be removable in the "OFF" position only. ASME A17.1-2016/CSA B44-10 Code Firefighters' Emergency Recall and Firefighter's Emergency In-car Operation shall override this feature.
  - 7. Provide emergency lighting unit. Device shall be built in and part of the car operating station at the upper section of the car station cover plate. Provide one quarter inch thick clear plastic lens cover or a type that shall be vandal resistant

over light fixture. Car lighting and alarm bell shall be connected to the Building Emergency Panel.

- a. The intensity of auxiliary lighting illumination shall be not less than 2 lx (0.2 fc), measured at any point between forty eight and thirty five inches above the car floor and approximately twelve inches centered horizontally in front of a car operating panel.
- 8. Suitably identify floor buttons, lighted alarm button, door open button, door close button and keyed emergency stop switch by engraved and painted letters or symbols per ADA requirements.
- 9. Provide illuminated alarm button at bottom of station to sound distress signal alarm located on the car top. Provide a signal to the elevator controller at a terminal strip for monitoring purposes of alarm at a remote location.
- 10. Provide a Firefighters' Operation Panel as required by ASME A17.1-2016/CSA B44-10 Code.
- 11. Provide lockable service panel with recessed flush cover plate, in the car station. Include the following controls, with purpose and operating positions identified by engraved letters painted black:
- 12. Emergency Stop Switch.
- 13. Car light switch and emergency light test switch. Test switch shall disconnect the electrical power to the main car lighting circuit.
- 14. Three position fan switch-Low Speed-High Speed-Off.
- 15. Independent service switch to permit selection of independent or automatic operation.
- 16. Start button for closing doors and starting elevator when operating on independent service. Floor pushbuttons may be used for this function.
- 17. Duplex 120 VAC electrical GFCI convenience outlet.
- 18. Elevator number engraved in car station; min. one inch high.
- 19. Inlaid capacity plate.
- 20. Install a new ADA compliant communication device as an integral part of the car operating panel. To include the hands free visual communication system, with wide angle camera.
- 21. Identify "HELP" button and visual indication with the phone symbol.
- 22. Provide International "No Smoking" Symbol four inches in diameter engraving at the top of the car operating panel.
- 23. Engrave in one quarter inch letters the AHJ Elevator Inspectors requirement for addressing the location of the Elevator Operating Permit.
- 24. Engrave in one inch letters the building name at the top area of the COP. Building name to be provided by Owner to Elevator Contractor.
- G. F. Car Top Inspection Station and Work Light:
  - 1. Operating fixture shall be provided containing continuous pressure Up, Down and Safe buttons, emergency stop switch, inspection and run switch.

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Modernization

- 2. Toggle switches shall not be provided for the Stop, Run and Inspection switches unless the switches are guarded against accidental activation.
- 3. Provide pendant style inspection operation station. Provide fixed metal bracket to store cord when not in use. Locate bracket to avoid stepping on cord when attached to bracket.
- 4. Provide 110 VAC outlets with a GFCI duplex receptacle.
- 5. Work light shall be encased in a glass enclosure including a wire guard cover. Rating of lamp(s) to be at least that which will generate the amount of illumination required by ASME A17.1-2016/CSA B44-10.
- 6. Provide additional light fixture on a flexible cord. Length of cord to be eight feet. Cord shall be hard wired into car top fixed work light. Provide fixed metal bracket to store cord when not in use. Locate bracket to avoid stepping on cord when attached to bracket. On-Off car top light switch shall control both fixtures. Provide guard on light. Rating of lamp(s) to be at least that which will generate the amount of illumination required by ASME A17.1-2016/CSA B44-10.
- H. In-Car Communication Intercom Systems:
  - 1. Provide new in-car emergency communication device. Provide necessary wiring between the elevator car, main lobby, and the elevator machine room.
- I. Car Door Operator:
  - 1. Provide new linear door operator. (Complete car door package).
    - a. The package shall include the following: lifting rods, pickup rollers, coupler/clutch assembly, car door electrical switch and related modernization hardware.
    - b. Opening speed shall not be less than 3-1/2 feet per second.
    - c. Closing speed shall not exceed the limitations set by the ASME A17.1-2016/CSA B44-10.
    - d. Doors shall be adjusted to provide a smooth opening and closing without erratic motion or closing hard.
- J. Door Coupler-Clutch:
  - 1. A new mechanical linear door operator compatible coupler/clutch shall be provided to connect the car and hoistway doors.
    - a. The operation of the coupler/clutch shall provide driving motion of the hoistway doors for fully open and full close direction.
    - b. The drive rollers shall remain engaged throughout the door open and close travel. This is intended to prevent separation of the hoistway doors from the car doors.
- K. Car Door Interlock:
  - 1. Provide new car door interlock. Locate switch so the elevator cannot operate unless the car doors are closed within the tolerance allowed by elevator safety code.

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- L. Alarm Bell:
  - 1. Furnish and install an audible signaling device located on top of the elevator adjacent to the car top inspection station.
- M. Car Toe Guard:
  - 1. Retain platform apron. Clean and Paint.
  - 2. Buffer Striking Plates:
    - a. Retain existing buffer striking plates. Replace any missing or damaged components. Paint to match the existing color.
    - b. Provide bevel washers for any bolt/nut that is installed in a plane of five degrees or greater.

# 2.08 CAR ENCLOSURE

- A. Retain existing steel shell.
  - 1. Elevator contractor carry a \$35,000 cab finish allowance.
  - 2. Cab allowance covers.
    - a. Re-clad entrance returns and transoms #4 stainless steel.
    - b. New raised panels on 3 walls 5 WL stainless steel finish. Arrange so as not to exceed 1/2 " reveal gap.
    - c. New flooring LVT or Roppe resilient tile.
    - d. New Handrails Stainless steel #4 finish.
  - 3. Car lighting recessed LED.
  - 4. New finish samples and selections shall be provided to Architect and Owner for selections during Submittal phase.
- B. Existing car sills retained.
- C. Car door panels:
  - 1. Retain and re-clad car door panels Stainless Steel 5WL finish.
  - 2. Provide new Gibs and fire retainers centered between Gibs.

# 2.09 LANDING CONTROL STATIONS

- A. Hall Call Stations
  - 1. Provide new surface mount vandal resistant hall stations.
    - a. New hall stations shall contain engraving and signage.
    - b. Hall stations shall be located in existing locations.
    - c. All signage for fire recall phase one instruction and in case of fire use stairs shall be supplied and installed by elevator contractor as temporary stainless steel placards adhesively affixed to the lobby walls in their proper locations accordingly.
    - d. new hall call stations shall be sized to cover existing back boxes without the need for additional cover plates.

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- B. Hoistway Access Station:
  - 1. Provide new surface mount hatch access key switches SS #4 finish directly adjacent to the driving door and cover existing back boxes without the need for additional cover plates.
  - 2. Demo old hoistway access stations patch and paint to match existing wall finishes.
- C. Fire fighters emergency operation
  - 1. Provide ASME A17.1-2016/CSA B44-10 Elevator Code Phase I Firefighters' Emergency Operation keyed switch with instructions directly adjacent on a Stainless Steel adhesive affixed placard. Provide a visual signal in the form of a fireman's hat symbol to indicate when Firefighters' Emergency Operation is in effect.
    - a. Install fixture location as required by AHJ Elevator Inspector and ASME A17.1-2016/CSA B44-10 Elevator Code.
  - 2. The key shall be FEOK1.
  - 3. Provide #4 Finish Stainless Steel cover plates. Provide #4 Finish Stainless Steel vandal resistant fastening screws on cover plate.

# 2.10 INTERCOM

- 1. Provide intercom system, in separate fixture, between the elevator cars and the designated level. On- Off activation is required at the lobby station. In car to lobby communication is voice activated. Provide necessary wiring between elevator car and lobby. Provide switch for ON & OFF positions. Engrave Intercom "ON and "OFF" and push to talk.
- 2. Provide #4 Finish surface mount Stainless Steel cover plates. Provide #4 Finish Stainless Steel vandal resistant fastening screws on cover plate.
- 3. Provide intercom between elevator car and elevator machine room. On-Off activation is required only at machine room station. In-car to machine room communication is voice activated. Provide necessary wiring between elevator car and machine room. Provide switch for ON & OFF positions.

# 2.11 SIGNALS

- 1. Car Position Indicator:
  - a. The new in car position indicator shall be part of the new operating station.
  - b. Provide a digital position indicator with directional arrows. The indicator shall be two inches in height. Blue digital display
- 2. Hall Lanterns:
  - a. New low profile surface mount vertical hall lanterns that cover existing back boxes without the need for additional cover plates.
  - b. SS # 4 finish Vandal Resistant Lanterns in existing locations. Provide adjustable tones for ADA up/down signals.

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# 2.12 SEISMIC REQUIREMENTS

- A. Rope Restraints:
  - 1. Provide hoist and governor rope sheaves with Rope Restraints as stated in ASME A17.1-2016/CSA B44-10.
    - a. The retainer shall be continuous over not less than 2/3 of the arc of contact between the rope and its sheave and shall be located so that no more than 1/8 of the arc of contact is exposed at each end of the retainer.
    - b. Rope restraints may be used in lieu of continuous guards provided they conform to the following:
    - c. Where the arc of contact is 30 deg or less and one rope restraint, located at the midpoint of the arc of contact is provided.
      - 1) Where the arc of contact exceeds 30 deg and restraints are provided at intervals not exceeding 30 deg or arc along the arc of contact and a restraint is located at each end of the arc of contact.
- B. Guarding of Snag Points:
  - 1. Provide guards to prevent the governor rope and electrical traveling cables from becoming snagged on guide rail brackets as stated by ASME A17.1-2016/CSA B44-10.
  - 2. Governor ropes where located twenty inches or less from a snag point.
  - 3. Suspension ropes where located twelve inches or less from a snag point.
  - 4. Traveling cables where any portion of their loop below the mid-point of the elevator travel is located thirty five inches or less horizontally from a snag point.
  - 5. Guide Rail Joints:
    - a. Retain existing seismic fish plates.
- C. Seismic Switch:
  - 1. Provide new seismic switch as required by ASME A17.1-2016/CSA B44-10. Locate switch as per manufacturer's instruction.
    - a. Switch shall activate upon excitation in a vertical direction of not more than 0.15 times gravity acceleration. The frequency response of the switch shall be 1 Hz to 10 Hz.
    - b. Upon activation the elevators which is in motion shall proceed to the nearest available floor, open their doors, and shut down; except that where Phase II emergency in-car operation is in effect, door operation shall conform to the requirements of ASME A17.1-2016/CSA B44-10.
- D. Counterweight Displacement Switch:
  - 1. Provide new counterweight displacement device(s) as stated in ASME A17.1-2016/CSA B44-10.
- E. Car and Counterweight Position Restraints:
  - 1. Provide new position restraints with the following:

#### Garage Elevator #4 Elevator

# Modernization

- 2. The clearance between each running face of the guide rail and the position restraint shall not exceed 3/16 inch and the depth of engagement with the rail shall be not less than the dimension of the side running face of the guide rail.
- F. Rail Fish Plates
  - 1. Retain existing.
  - 2. Check alignment of rails and tram as needed for smooth ride quality.
  - 3. Check all fastenings for tight.
- G. Rope Retainers
  - 1. Provide rope retainers on all sheaves ( Drive and Deflector) to prevent ropes from jumping off during a seismic event.
- H. Car Top Emergency Exit:
  - 1. The emergency exit shall be so arranged that it can be opened from within the car by means of a keyed spring-return cylinder-type lock having not less than a five-pin or five-disk combination and operated from the top of the car without the use of a key.
  - 2. The key required to open the emergency exit lock shall be kept on the premises in a location readily accessible to authorized persons, not available to the public. No other key to the building shall unlock the emergency exit lock.
  - 3. The top emergency exit shall be provided with a car door electrical contact conforming to ASME A17.1-2016/CSA B44-10 and so located as to be inaccessible from the inside of the car. The opening of the electrical contact shall limit the car speed to not more than 150 feet per minute.
  - 4. The electrical switch shall be positively opened by a lever or other device attached to and operated by the exit panel.
  - 5. The switch shall be maintained in the open position by the action of gravity or by a restrained compression spring, or both, or by positive mechanical means.

# PART 3 - EXECUTION

# 3.01 SITE CONDITION INSPECTION

- A. Prior to beginning the Elevator Modernization, Elevator Contractor shall survey the machine room, hoistway and pit. Elevator Contractor shall verify, in writing, that no conditions exist which adversely could affect their Work. The Elevator Contractor shall verify all existing dimensions relevant to the scope of work.
- B. Do not proceed with Elevator Modernization until possible concerns/problems conforms to project requirements.
- C. Installation Requirements
  - 1. A complete Elevator Technical Specification Manual shall be on-site during the Elevator Modernization.
  - 2. Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the respective manufacturer's instructions unless more stringent requirements are specified.

- 3. Elevator Contractor shall provide written documentation that Elevator Contractor has installed and adjusted the elevator controller/selector as specified in these Specifications. Elevator Contractor shall evidence, in writing, that Elevator Contractor's adjuster has attended the controller/selector manufacturer's training. Elevator Contractor shall provide controller/selector installation/troubleshooting training to their on-site Mechanics/Apprentices that will be installing and servicing/maintaining the elevator equipment.
- 4. On-site installation and maintenance Mechanics/adjusters shall always have, onsite, a working cell phone. The names and phone number(s) shall be provided to Owner before the Elevator Modernization starts.

# **3.02 INSTALLATION**

- A. No Rattle/Impact guns shall be allowed on-site unless approved by Owner.
- B. Install elevator equipment in accordance with Manufacturer's direction, referenced Codes, and Specifications.
- C. Install elevator equipment so they may be easily removed for maintenance and repair.
- D. Install elevator equipment so that access for maintenance is safe and readily available.

## 3.03 FIELD QUALITY CONTROL

A. Work at the job site will be checked during Elevator Modernization. Accomplish corrective Work required prior to performing further installation.

### **3.04 ADJUSTMENTS**

A. Adjust elevator equipment to achieve required performance levels.

# 3.05 PAINTING AND FINISHES

A. Natural metals shall be of the best grade and shall have the grain of belting in the direction of the longest dimension with a fine, brushed finish. Surfaces shall be perfectly smooth and without waves.

### 3.06 RIDE QUALITY

- A. Horizontal vibration, side to side and front to back with car during normal operation shall not exceed 25 mg in the 1-10 Hz range.
- B. Vertical vibration not more than 20 mg. Provide smooth and constant acceleration and deceleration of not more than 2.8 feet/second/second with an initial ramp between 0.5 and 0.75 second.
- C. Provide smooth and constant acceleration and deceleration of not more than 2.8 feet/second/second with an initial ramp between 0.5 and 0.75 second.
- D. Provide no more than 12 ft/sec3 of maximum jerk.

# **3.07 PERFORMANCE**

- A. Speed: +/- 1% of contract speed under any loading condition or direction of travel.
- B. Stopping Accuracy: +/- 1/16 inch under any loading condition or direction of travel.

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- C. Door Opening Time: Seconds from start of opening to fully open:
  - 1. 3.5 seconds
  - 2. Door Closing Time: Seconds from start of car door closing until car doors are in the fully closed position and the elevator can start.
- D. Floor-to-Floor Performance Time: Seconds from start of car doors closing until car doors are 3/4 open and car level and stopped at next successive floor under any loading condition or travel direction.
  - 1. 10.5 seconds (based on 12' travel)
  - 2. Provide a smooth start, acceleration, high speed operation, deceleration and final stop in both directions.

# 3.08 ACCEPTANCE INSPECTION AND TESTS

- A. Furnish labor, materials and equipment necessary for tests. Notify Elevator Consulting Services Inc., seven days in advance when ready for final inspection. Final acceptance of Elevator Modernization shall be considered only after field-quality control reviews have been completed, identified deficiencies have been corrected, submittals and certificates have been received and the following items have been completed to the satisfaction Elevator Consulting Services Inc.
  - 1. Quality of Work and equipment comply with specification.
  - 2. Performance of following is satisfactory:
    - a. Door operation and closing force.
    - b. Signal fixtures.
    - c. Firefighters Service Emergency Operation.
    - d. Performance times.
    - e. Car speed.
    - f. Seismic testing.
- B. Conduct the following tests: Four-hour running test stopping at each floor in up and down directions. The doors are to complete a full open and close cycle with the standard door dwell time operating.
  - 1. Rated (full) capacity.
  - 2. Balanced car.
  - 3. Empty car.
  - 4. Performance Guarantee: Should tests reveal defects, poor quality of Work, variance or noncompliance with requirements of specified Codes and/or ordinances, or variance or noncompliance with the requirements of specifications, complete corrective Work to satisfaction of Elevator Consulting Services Inc., at no additional cost to Owner.
  - 5. Replace equipment that does not meet Code or Specification requirements.
  - 6. Perform Elevator Modernization including labor, materials and equipment necessary to meet specified operation and performance.
  - 7. Perform and assume cost, including expenses, for re-testing and re-inspections required by AHJ Elevator Inspector and Elevator Consulting Services Inc., to

> verify specified operation, performance and requirements of contract documents have been completed to the satisfaction of, AHJ Elevator Inspector and Elevator Consulting Services Inc.

## 3.09 CLOSE OUT ACTIVITIES

- A. Demonstrate proper operation of equipment to owners designated representative.
- B. Ensure Elevator has been turned over to maintenance department and owner has the proper dispatch number to call if elevator needs service or experiences a trouble call.
- C. Train owner representative on maintenance portal and monitoring systems.

## END OF SECTION 14 21 00

## SECTION 23 81 00 UNITARY AIR-CONDITIONING EQUIPMENT

## PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. Air-Conditioning, Heating, and Refrigeration Institute (AHRI): 210/240, Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
  - 2. Air Moving and Conditioning Association (AMCA): Bulletin 300, Setup No. 1.
  - 3. American Gas Association (AGA).
  - 4. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
    - a. 52.2, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
    - b. 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.
  - 5. American Society of Mechanical Engineers (ASME): BPVC Section IX, Welding and Brazing Qualifications.
  - 6. ASTM International (ASTM):
    - a. B117, Standard Practice for Operating Salt Spray (Fog) Apparatus.
    - b. D2370, Standard Test Method for Tensile Properties of Organic Coatings.
    - c. D4060, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
    - d. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
    - e. G154, Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.
  - 7. Canadian Standards Association (CSA).
  - 8. ETL Testing Laboratories (ETL).
  - 9. International Organization for Standardization (ISO):
    - a. 9001, Quality Management Systems Requirements.
    - b. 13256-1, Water-Source Heat Pumps—Testing and Rating for Derformence — Dert 1: Water to Air and Prine to Air Heat Pum
      - Performance—Part 1: Water-to-Air and Brine-to-Air Heat Pumps.
  - 10. National Electrical Manufacturers Association (NEMA).

- 11. National Fire Protection Association (NFPA): 255, Standard Method of Test of Surface Burning Characteristics of Building Materials
- 12. UL: 94, Safety Standard for Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

# 1.02 DEFINITIONS

- A. The following is a list of abbreviations which may be used in this section:
  - 1. AC: Air Conditioning.
  - 2. COP: Coefficient of Performance.
  - 3. DX: Direct Expansion.
  - 4. EER: Energy Efficiency Ratio.
  - 5. HP: Heat Pump.
  - 6. IR: Infra Red.
  - 7. LED: Light Emitting Diode.
  - 8. PSC: Permanent Split Capacitor.
  - 9. PTAC: Packaged Terminal Air Conditioner.
  - 10. SPST: Single Pole, Single Throw.
  - 11. TXV: Thermostatic Expansion Valve.
  - 12. UV: Ultraviolet.

## 1.03 SUBMITTALS

- A. Action Submittals:
  - 1. Shop Drawings:
    - a. Complete Specifications, descriptive Drawings, catalog cuts, and descriptive literature which shall include make, model, dimensions, weight of equipment, and electrical schematics for all products specified.
    - b. Manufacturer's standard finish color selection for enclosure finishes.
    - c. Complete performance data that will indicate full compliance with Specification:
      - 1) Include fan sound power level data (ref. 10 to 12 watts) at design operating point, based on AMCA Bulletin 300, Setup No. 1.
      - 2) Include heating and cooling performance data at design operating conditions.

- B. Informational Submittals:
  - 1. Manufacturer's documentation that media filter modules rated UL Class 1.
  - 2. Detailed information on structural, mechanical, electrical, or other modifications necessary to adapt arrangement or details shown to equipment furnished.
  - 3. Sample copy of guarantee.
  - 4. Test reports.
  - 5. Operation and Maintenance Data.
    - a. Include wiring and control diagrams for equipment.
    - b. Include as-built version of equipment schedules.

### 1.04 QUALITY ASSURANCE

- A. Heating and Cooling Equipment: Minimum operating efficiencies, defined as COP and EER, as specified in ASHRAE 90.1.
- B. Unit shall be rated (when matched with appropriate outdoor unit) per AHRI 210/240.
- C. Units shall be certified by UL and CSA, and shall be UL or ETL listed and labeled.
- D. Cooling performance rated in accordance with AHRI testing procedures.

# 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.
- B. Protection of Equipment:
  - 1. Box, crate, or otherwise protect from damage and moisture during shipment, handling, and storage.
  - 2. Protect from exposure to corrosive fumes and keep thoroughly dry at all times.
  - 3. Store motors, drives, electrical equipment, and other equipment with antifriction or sleeve bearings in weathertight and heated storage facilities prior to installation.
  - 4. For extended storage periods, plastic equipment wrappers shall not be used to prevent accumulation of condensate in gears and bearings.

## 1.06 SPECIAL GUARANTEE

 A. Refrigerant Compressors: Furnish manufacturer's extended guarantee or warranty, with Owner named as beneficiary, in writing, as special guarantee. Special guarantee shall provide for correction, or at the option of Owner, removal and replacement of compressors specified in this Specification found defective during a period of 5 years after date of Substantial Completion. Duties and obligations for correction or removal and replacement of defective Work as specified in the General Conditions.

### 1.07 EXTRA MATERIALS

A. Furnish, tag, and box for shipment and storage the following materials:

Item	Quantity
Filters	One complete set per unit.

## PART 2 PRODUCTS

- 2.01 GENERAL
  - A. Specified components of this section, including insulation, facings, mastics, and adhesives, shall have fire hazard rating not to exceed 25 for flame spread without evidence of continued progressive combustion, and 50 for smoke developed, as per test conducted in accordance with ASTM E84 and NFPA 255 methods.

### 2.02 EQUIPMENT SCHEDULES

A. Refer to Drawings.

### 2.03 SPLIT SYSTEM HIGH WALL AC UNIT, DUCTLESS

- A. General:
  - 1. Split system, indoor, DX, ductless, fan coil AC unit, complete with DX coil, fan, fan motor, piping connectors, electrical controls, and microprocessor control system.
  - 2. Suitable for use with air conditioner or heat pump outdoor unit.
  - 3. Indoor unit shall be of the same manufacturer as the associated outdoor unit.

- B. Unit Cabinet:
  - 1. High-impact plastic or painted galvanized steel.
  - 2. Fully insulated.
  - 3. Discharge and inlet grilles, high-impact polystyrene.

# C. Evaporator Fan:

- 1. Tangential direct-drive blower type with air intake at upper front face of unit and discharge at bottom front.
- 2. Air Sweep:
  - a. Provide automatic, motor-driven horizontal air sweep as standard.
  - b. Air sweep operation shall be user selectable.
  - c. Vertical direction may be manually adjusted and horizontal air sweep may be manually set.
- 3. Motor:
  - a. Open drip-proof, permanently lubricated ball bearing with inherent overload protection.
  - b. Minimum three speed.
- D. DX Evaporator Coil:
  - 1. Copper tube with aluminum fins and galvanized steel tube sheets.
  - 2. Fins bonded to tubes by mechanical expansion.
  - 3. Condensate Drip Pan:
    - a. Locate under coil with drain connection for hose attachment to remove condensate.
    - b. Provide internal trap and auxiliary drip pan under coil header.
- E. Controls:
  - 1. Refrigerant Metering: Factory installed refrigerant metering device.
  - 2. Automatic restart after power failure at same operating conditions as at failure.
  - 3. Timer function to provide a minimum 15-hour timer cycle for system AUTO/START/STOP.
  - 4. Temperature-sensing controls shall sense return air temperature. Provide indoor air high discharge temperature shutdown.
  - 5. Indoor coil freeze protection.
  - 6. Wireless infrared remote control to enter set points and operating conditions.
  - 7. Filter status indication after 250 hours of indoor fan operation.
  - 8. Test mode button to run self-diagnostics and aid in troubleshooting.
  - 9. AUTO/STOP features shall have integral setback control.
  - 10. Automatic air sweep control provides ON or OFF activation of air sweep louvers.

- 11. Dehumidification mode provides increased latent removal capability by modulating fan speed and set point temperature.
- 12. Fan only operation provides room air circulation when no cooling is required.
- 13. Diagnostics to provide continuous checks of unit operation and warn of possible malfunctions. Error message shall be displayed at unit and at remote controller.
- 14. Fan Speed Control: User-selectable for high, medium, low or microprocessor automatic operation during all operating modes.
- 15. Time delay shall prevent compressor restart in less than 3 minutes.
- 16. Provide outdoor unit high temperature protection to detect excessive outdoor unit discharge temperatures.
- 17. Automatic heating-to-cooling changeover to provide automatic heating and cooling operation. Control shall include deadband to prevent rapid mode cycling.
- 18. Manual defrost button to initiate defrost cycle from handset.
- 19. Demand defrost shall be provided and shall minimize defrost cycles by internally adjusting defrost timing based on frost accumulation.
- 20. Provide indoor coil high temperature protection to detect excessive indoor discharge temperature when unit is in heat pump mode.
- F. Air Filters: Filter track with factory-supplied cleanable filters.
- G. Accessories:
  - 1. Provide as scheduled in Equipment Schedule and as follows:
    - a. Internal Condensate Pump:
      - 1) To remove condensate from drain pan.
      - 2) Lift Capability: 25-foot WC.
      - 3) Float control in condensate drain pan to shut unit down in case of pump malfunction.
    - b. Wall Mount Thermostat Mounting Kit: Locking cover kit available for IR controller.
- H. Manufacturers and Products:
  - 1. Carrier; 40QN Series.
  - 2. EnviroAir; Model ECW.
  - 3. Mitsubishi; Mr. Slim.
  - 4. Trane; Model TPKA.
# 2.04 SPLIT SYSTEM AC OUTDOOR UNITS

- A. General:
  - 1. Factory assembled, single piece, air-cooled air conditioner outdoor unit.
  - 2. Contained within the unit enclosure shall be factory wiring, piping, controls, compressor, and holding charge of R-410A refrigerant.
  - 3. Outdoor unit shall be same manufacturer as associated indoor unit.
  - 4. Refer to Division 14 for temperature setpoint range.
- B. Unit Cabinet:
  - 1. Constructed of galvanized steel, phosphatized and coated with a baked enamel finish.
  - 2. Removable access panels for access to internal components.
  - 3. Outdoor Compartment: Isolated, with acoustic lining to ensure quiet operation.
  - 4. Knockouts for unit electrical power.
- C. Condenser Fans:
  - 1. Direct-drive propeller type shall discharge air vertically and shall blow air through outdoor coil.
  - 2. Motors:
    - a. Totally enclosed, with Class B insulation and permanently lubricated bearings.
    - b. Thermal overload protection.
  - 3. Shaft of galvanized or stainless steel construction.
  - 4. Fan blades shall be corrosion-resistant and be statically and dynamically balanced.
  - 5. Equip openings with PVC-coated protection grille over fan and coil.
- D. Compressor:
  - 1. Fully hermetic reciprocating or scroll type.
  - 2. Equipped with oil system, operating oil charge, and motor.
  - 3. Internal overloads shall protect compressor from overtemperature and overcurrent.
  - 4. Motor: NEMA rated, Class F, suitable for operation in a refrigerant atmosphere.
  - 5. Scroll compressors shall have high discharge gas temperature protection.

- 6. Reciprocating compressors shall be equipped with crankcase heaters to minimize liquid refrigerant accumulation in compressor during shutdown and to prevent refrigerant dilution of oil.
- 7. Installed on rubber vibration isolators and shall have internal spring isolation.
- E. Condenser Coil: Constructed of aluminum fins mechanically bonded to internally enhanced seamless copper tubes that are cleaned, dehydrated, and sealed.
- F. Refrigeration Components:
  - 1. Brass external liquid line service valve with service gauge port connections.
  - 2. Suction line service valve with service gauge connection port.
  - 3. Service gauge port connections on compressor suction and discharge lines with Schrader-type fittings with brass caps.
  - 4. Suction Line: Accumulator.
  - 5. Pressure relief.
- G. Controls:
  - 1. Factory selected, assembled, and tested.
  - 2. Automatic restart on power failure.
  - 3. Three-pole contactors.
  - 4. Time delay control sequence shall be provided standard through control board on indoor units.
  - 5. High pressure and liquid line low pressure switches.
  - 6. Automatic outdoor fan motor protection.
  - 7. Start capacitor and relay (single-phase units without scroll compressors).
  - 8. Defrost board to provide defrost control.
  - 9. Safeties:
    - a. Time delay restart to prevent compressor reverse rotation on single-phase scroll compressors.
    - b. Safety lockout if an outdoor unit safety is open.
    - c. High condensing temperature protection.
    - d. System diagnostics.
    - e. Compressor motor current and temperature overload protection.
    - f. High pressure relief.
    - g. Outdoor fan failure protection.
- H. Accessories: Provide as scheduled in Equipment Schedule.

- I. Manufacturers:
  - 1. Carrier.
  - 2. Trane.
  - 3. Rheem.
  - 4. Lennox International.
  - 5. Addison.
  - 6. Mitsubishi.
  - 7. York Air Conditioning.

# 2.05 UNITARY EQUIPMENT CONTROLS

- A. Electric Thermostat:
  - 1. Two-position electric type.
  - 2. Temperature Scale: Furnish 50 degrees F to 90 degrees F scale.
  - 3. Adjustments external to units.
  - 4. Adjustable sensitivity.
  - 5. Nonlocking cover.
  - 6. Insulating back, where exterior mounting is indicated.

# 2.06 ELECTRICAL

- A. General:
  - 1. Units shall include high and low voltage terminal block connections.
  - 2. Control voltage to indoor unit fan shall be 24 volts.
  - 3. Motor Starters/Contactors: Factory installed with unitary equipment, unless otherwise noted.
  - 4. Disconnects: Factory installed nonfused disconnects or circuit breakers on each unit, unless otherwise noted.
- B. Motors:
  - 1. Refer to Section 26 24 19, Low-Voltage Motor Control, for general requirements.
  - 2. Unless otherwise stated, electric motors shall comply with the following:
    - a. Voltage, Phase, Horsepower, Synchronous Speed: Refer to Equipment Schedule for motor driven equipment.
    - b. Enclosure: ODP, unless specified otherwise.
    - c. Torque Characteristics: Sufficient to accelerate driven loads satisfactorily.
    - d. Winding Thermal Protection: Manufacturer's standard.
    - e. Space Heater: Manufacturer's standard.

- f. Multispeed Motors, Synchronous Speed, Number of Windings: Manufacturer's standard.
- g. Efficiency: Minimum efficiency per Section 26 24 19, Low-Voltage Motor Control.

## 2.07 ACCESSORIES

A. Equipment Identification Plates: Furnish 16-gauge stainless steel identification plate securely mounted on each separate equipment component in a readily visible location. Plate shall bear block type equipment identification number and letters indicated in this Specification.

## 2.08 SOURCE QUALITY CONTROL

- A. Factory Tests:
  - 1. Direct expansion coils leak tested underwater with 200-psig air. Pressure tested to 450 psig.
  - 2. Electric heating coils tested with 2,000-volt dielectric test.

## PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. General:
  - 1. Install equipment in accordance with manufacturer's recommendations, and these Specifications.
  - 2. Set and install equipment so equipment is level and properly supported.
  - 3. Ensure piping connections to equipment do not cause strain on equipment.
  - 4. Ensure vibration isolation has been installed per manufacturer's instructions and isolation devices are performing satisfactorily.
  - 5. Install safety devices as recommended by manufacturer and required by code.
- B. Seal outside air intake watertight to roof curb.
- C. Isolate sheet metal duct connections from portions of unit not internally spring-isolated from fans, or other vibrating or rotating equipment.
- D. Inspect internal casing insulation, seal exposed edges, and butt joints with mastic to ensure insulation will not be loosened during operation.

- E. Filters:
  - 1. Install set of filters in each unit before operating and leave in place during startup and testing to keep equipment and ductwork clean.
  - 2. Do not operate units until filters are installed. If operated without filters, completely clean ductwork, coils, and interior of units.
- F. Lubricate unsealed bearings prior to startup.

## 3.02 FIELD QUALITY CONTROL

- A. Initial equipment testing and startup shall be made by authorized representative of unit manufacturer.
- B. Air-cooled outdoor unit shall not be started without complete prestart checkout of entire refrigerant piping system and charging of system with refrigerant as recommended by equipment manufacturer.
- C. Field Testing: Manufacturer shall provide factory-trained representative employed by equipment manufacturer to perform the following services. Supervision only, of Contractor personnel, will not be acceptable.
  - 1. Leak test.
  - 2. Refrigerant pressure test.
  - 3. Evacuate (if required).
  - 4. Dehydrate (if required).
  - 5. Charge condensing unit with refrigerant and oil (if required).

## **END OF SECTION**

## SECTION 26 05 02 BASIC ELECTRICAL REQUIREMENTS

## PART 1 GENERAL

#### 1.01 RELATED SECTIONS

A. Requirements specified within this section apply to Division 26, Electrical. Work specified herein shall be performed as if specified in the individual sections.

#### 1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. National Electrical Contractors Association (NECA): National Electrical Installation Standards.
  - 2. National Electrical Manufacturers Association (NEMA):
    a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    b. Z535.4, Product Safety Signs and Labels.
  - 3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).

#### 1.03 ELECTRIC AND TELEPHONE SERVICE DIVISION OF RESPONSIBILITY

- A. Incoming underground electrical service facilities provided by the serving utility as part of its normal obligation to customers is existing to the facility.
- B. Incoming telephone service facilities provided by the serving utilities as part of their normal obligation to customers is existing to the facility.
- C. Interior telecommunications central and station equipment (telephone instruments, telephone switches, data switches, and hubs, servers, software, etc.) is Work provided outside this Contract. Under this Contract, provide raceways, outlet and junction boxes, cover plates, data outlets, and CAT6 cables as indicated.

#### 1.04 SUBMITTALS

A. Action Submittals: Provide manufacturers' data for the following: Nameplates, signs, and labels.

## 1.05 QUALITY ASSURANCE

- A. Provide the Work in accordance with NFPA 70. Where required by Authority Having Jurisdiction (AHJ), material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ, in order to provide a basis for approval under the NEC.
- B. Materials and equipment manufactured within the scope of standards published by UL shall conform to those standards and shall have an applied UL listing mark or label.
- C. Provide materials and equipment acceptable to AHJ for Class, Division, and Group of hazardous area indicated.

#### 1.06 ENVIRONMENTAL CONDITIONS

- A. The following areas are classified nonhazardous and wet. Use materials and methods required for such areas.
  - 1. Outdoor abovegrade areas.
  - 2. Elevator pit.
- B. The following areas are classified as indoor and dry:
  - 1. Elevator controller room.
  - 2. Elevator lobbies.
- C. The following areas are not classified. Use dust-tight and oil-tight NEMA 12 materials and methods: Areas not covered above.

## PART 2 PRODUCTS

- 2.01 GENERAL
  - A. Where two or more units of the same class of material or equipment are required, provide products of a single manufacturer. Component parts of materials or equipment need not be products of the same manufacturer.
  - B. Material and equipment installed in heated and ventilated areas shall be capable of continuous operation at their specified ratings within an ambient temperature range of 40 degrees F to 104 degrees F.

#### 2.02 EQUIPMENT FINISH

A. Manufacturer's standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment in, light gray color finish as approved by Owner.

BASIC ELECTRICAL REQUIREMENTS 26 05 02 - 2

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## 2.03 NAMEPLATES

- A. Material: Laminated plastic.
- B. Attachment Screws: Stainless steel.
- C. Color: Black, engraved to a white core.
- D. Letter Height:
  - 1. Pushbuttons/Selector Switches: 1/8-inch.
  - 2. Other Electrical Equipment: 1/4-inch.

## 2.04 SIGNS AND LABELS

A. Sign size, lettering, and color shall be in accordance with NEMA Z535.4.

# PART 3 EXECUTION

#### 3.01 GENERAL

- A. Electrical Drawings show general locations of equipment, devices, and raceway, unless specifically dimensioned. Contractor shall be responsible for actual location of equipment and devices and for proper routing and support of raceways, subject to approval of Engineer.
- B. Check approximate locations of light fixtures, switches, electrical outlets, equipment, and other electrical system components shown on the Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, notify Engineer in writing.
- C. Install Work in accordance with NECA Standard of Installation, unless otherwise specified.
- D. Keep openings in boxes and equipment closed during construction.
- E. Lay out Work carefully in advance. Do not cut or notch any structural member or building surface without specific approval of Engineer. Carefully perform cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, paving, or other surfaces required for the installation, support, or anchorage of conduit, raceways, or other electrical materials and equipment. Following such Work, restore surfaces to original condition.

## 3.02 ANCHORING, BRACING, AND MOUNTING

A. Equipment anchoring and mounting shall be in accordance with manufacturer's requirements.

## 3.03 COMBINING CIRCUITS INTO COMMON RACEWAY

- A. Homerun circuits shown on the Drawings indicate functional wiring requirements for power and control circuits. Circuits may be combined into common raceways in accordance with the following requirements:
  - 1. Analog control circuits from devices in same general area to same destination.
    - a. No power or ac discrete control circuits shall be combined in same conduit with analog circuits.
    - b. No Class 2 or Class 3 circuits including, but not limited to, HVAC control circuits, fire alarm circuits, paging system circuits shall be combined with power or Class 1 circuits.
    - c. Analog circuits shall be continuous from source to destination. Do not add TJB, splice, or combine into a multi-pair cable without authorization of Engineer.
    - d. Raceways shall be sized per General Circuit and Raceway Schedule and do not exceed 40 percent fill.
    - e. Changes shall be documented on Record Drawings.
  - 2. Discrete control circuits from devices in the same general area to the same destination.
    - a. No power or analog control circuits shall be combined in same conduit with discrete circuits.
    - b. No Class 2 or Class 3 circuits including, but not limited to, HVAC control circuits, fire alarm circuits, and paging system circuits shall be combined with power or Class 1 circuits.
    - c. Raceways shall be sized per the General Circuit and Raceway Schedule and do not exceed 40 percent fill.
    - d. Changes shall be documented on record Drawings.
  - 3. Power circuits from loads in same general area to same source location (such as: panelboard, switchboard, low voltage motor control center).
    - a. Lighting Circuits: Combine no more than three two circuits to a single raceway. Contractor shall be responsible for increasing conduit and conductor size if derating is required by NEC.
    - b. Receptacle Circuits, 120 Volt Only: Combine no more than three two circuits to a single raceway. Provide a separate neutral conductor for each circuit. Contractor shall be responsible for

increasing conduit and conductor size if derating is required by NEC.

c. All Other Power Circuits: Do not combine power circuits without authorization of Engineer.

## 3.04 NAMEPLATES, SIGNS, AND LABELS

- A. Arc Flash Protection Warning Signs: Field mark panelboards to warn qualified persons of potential arc-flash hazards. Locate marking so to be clearly visible to persons before working on energized equipment.
- B. Equipment Nameplates:
  - 1. Provide a nameplate to label electrical equipment including panelboards, motor starters, terminal junction boxes, disconnect switches, switches and control stations.
  - 2. Terminal junction box nameplates shall include equipment designation.
  - 3. Disconnect switch, starter, and control station nameplates shall include name and number of equipment powered or controlled by that device.
  - 4. Panelboard nameplates shall include equipment designation, service voltage, and phases.

## 3.05 LOAD BALANCE

- A. Drawings and Specifications indicate circuiting to electrical loads and distribution equipment.
- B. Balance electrical load between phases as nearly as possible on switchboards, panelboards, motor control centers, and other equipment where balancing is required.
- C. When loads must be reconnected to different circuits to balance phase loads, maintain accurate record of changes made, and provide circuit directory that lists final circuit arrangement.

#### 3.06 CLEANING AND TOUCHUP PAINTING

- A. Cleaning: Throughout the Work, clean interior and exterior of devices and equipment by removing debris and vacuuming.
- B. Touchup Paint:
  - 1. Touchup scratches, scrapes and chips on exterior and interior surfaces of devices and equipment with finish matching type, color, and consistency and type of surface of original finish.

2. If extensive damage is done to equipment paint surfaces, refinish entire equipment in a manner that provides a finish equal to or better than factory finish, that meets requirements of Specification, and is acceptable to Engineer.

## 3.07 PROTECTION FOLLOWING INSTALLATION

- A. Protect materials and equipment from corrosion, physical damage, and effects of moisture on insulation and contact surfaces.
- B. When equipment intended for indoor installation is installed at Contractor's convenience in areas where subject to dampness, moisture, dirt or other adverse atmosphere until completion of construction, ensure adequate protection from these atmospheres is provided and acceptable to Engineer.

# **END OF SECTION**

## SECTION 26 05 04 BASIC ELECTRICAL MATERIALS AND METHODS

## PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. ASTM International (ASTM):
    - a. A1011/A1011M, Standard Specification for Steel, Sheet, and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy and High-Strength Low Alloy Formability.
    - b. E814, Method of Fire Tests of Through-Penetration Fire Stops.
  - 2. Canadian Standards Association (CSA).
  - 3. Institute of Electrical and Electronics Engineers, Inc. (IEEE): 18, Standard for Shunt Power Capacitors.
  - 4. International Society of Automation (ISA): RP12.06.01, Wiring Practices for Hazardous (Classified) Locations Instrumentation–Part 1: Intrinsic Safety.
  - 5. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
    - b. C12.1, Code for Electricity Metering.
    - c. C12.6, Phase-Shifting Devices Used in Metering, Marking and Arrangement of Terminals.
    - d. ICS 2, Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
    - e. ICS 5, Industrial Control and Systems: Control Circuit and Pilot Devices.
    - f. KS 1, Enclosed and Miscellaneous Distribution Switches (600 Volts Maximum).
  - 6. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
  - 7. UL:
    - a. 98, Standard for Enclosed and Dead-Front Switches.
    - b. 248, Standard for Low Voltage Fuses.
    - c. 486E, Standard for Equipment Wiring Terminals for use with Aluminum and/or Copper Conductors.
    - d. 489, Standard for Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
    - e. 508, Standard for Industrial Control Equipment.
    - f. 810, Standard for Capacitors.

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- g. 943, Standard for Ground-Fault Circuit-Interrupters.
- h. 1059, Standard for Terminal Blocks.
- i. 1479, Fire Tests of Through-Penetration Fire Stops.

## 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Provide manufacturers' data for the following:
    - a. Control devices.
    - b. Circuit breakers.
    - c. Fused switches.
    - d. Nonfused switches.
    - e. Fuses.
    - f. Firestopping.
    - g. Enclosures: Include enclosure data for products having enclosures.

#### 1.03 EXTRA MATERIALS

- A. Furnish, tag, and box for shipment and storage the following spare parts and special tools:
  - 1. Fuses, 0 Volt to 600 Volts: Six of each type and each current rating installed.

## PART 2 PRODUCTS

# 2.01 MOLDED CASE CIRCUIT BREAKER THERMAL MAGNETIC, LOW VOLTAGE

- A. General:
  - 1. Type: Molded case.
  - 2. Trip Ratings: 15 amps to 800 amps.
  - 3. Voltage Ratings: 120, 240, 277, 480, and 600V ac.
  - 4. Suitable for mounting and operating in any position.
  - 5. UL 489.
- B. Operating Mechanism:
  - 1. Over center, trip-free, toggle type handle.
  - 2. Quick-make, quick-break action.
  - 3. Locking provisions for padlocking breaker in OPEN position.
  - 4. ON/OFF and TRIPPED indicating positions of operating handle.
  - 5. Operating handle to assume a CENTER position when tripped.

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- C. Trip Mechanism:
  - 1. Individual permanent thermal and magnetic trip elements in each pole.
  - 2. Variable magnetic trip elements with a single continuous adjustment 3X to 10X for frames greater than 100 amps.
  - 3. Two and three pole, common trip.
  - 4. Automatically opens all poles when overcurrent occurs on one pole.
  - 5. Test button on cover.
  - 6. Calibrated for 40 degrees C ambient, unless shown otherwise.
  - 7. Do not provide single-pole circuit breakers with handle ties where multi-pole circuit breakers are shown.
- D. Short Circuit Interrupting Ratings:
  - 1. Equal to rating of existing equipment.
    - a. Up to 100A, less than 250V ac:10,000 amps
    - b. Up to 100A, 250V ac to 600V ac:14,000 amps.
  - 2. Series Connected Ratings: Do not apply series connected short circuit ratings.
- E. Ground Fault Circuit Interrupter (GFCI): Where indicated, equip breaker as specified above with ground fault sensor and rated to trip on 5-mA ground fault within 0.025 second (UL 943, Class A sensitivity, for protection of personnel.
  - 1. Ground fault sensor shall be rated same as circuit breaker.
  - 2. Push-to-test button.
- F. Accessories: Shunt trip, auxiliary switches, handle lock ON devices, mechanical interlocks, key interlocks, unit mounting bases, double lugs as shown or otherwise required. Shunt trip operators shall be continuous duty rated or have coil-clearing contacts.
- G. Connections:
  - 1. Supply (line side) at either end.
  - 2. Mechanical wire lugs, except crimp compression lugs where shown.
  - 3. Lugs removable/replaceable for breaker frames greater than 100 amperes.
  - 4. Suitable for 75 degrees C rated conductors without derating breaker or conductor ampacity.

- H. Enclosures for Independent Mounting:
  - 1. See Article Enclosures.
  - 2. Service Entrance Use: Breakers in required enclosure and required accessories shall be UL 489 listed.
  - 3. Interlock: Enclosure and switch shall interlock to prevent opening cover with switch in the ON position. Provide bypass feature for use by qualified personnel.

## 2.02 FUSED SWITCH, INDIVIDUAL, LOW VOLTAGE

- A. UL 98 listed for use and location of installation.
- B. NEMA KS 1.
- C. Short Circuit Rating: 200,000 amps rms symmetrical with Class R, Class J, or Class L fuses installed.
- D. Quick-make, quick-break, motor rated, load-break, heavy-duty (HD) type with external markings clearly indicating ON/OFF positions.
- E. Connections:
  - 1. Mechanical lugs, except crimp compression lugs where shown.
  - 2. Lugs removable/replaceable.
  - 3. Suitable for 75 degrees C rated conductors at NEC 75 degrees C ampacity.
- F. Fuse Provisions:
  - 1. 30-amp to 600-amp rated shall incorporate rejection feature to reject all fuses except Class R.
  - 2. 601-amp rated and greater shall accept Class L fuses, unless otherwise shown.
- G. Enclosures: See Article Enclosures.
- H. Interlock: Enclosure and switch to prevent opening cover with switch in ON position. Provide bypass feature for use by qualified personnel.

## 2.03 NONFUSED SWITCH, INDIVIDUAL, LOW VOLTAGE

- A. NEMA KS 1.
- B. Quick-make, quick-break, motor rated, load-break, heavy-duty (HD) type with external markings clearly indicating ON/OFF positions.

- C. Lugs: Suitable for use with 75 degrees C wire at NEC 75 degrees C ampacity.
- D. Enclosures: See Article Enclosures.
- E. Interlock: Enclosure and switch to prevent opening cover with switch in ON position. Provide bypass feature for use by qualified personnel.

## 2.04 FUSE, 250-VOLT AND 600-VOLT

- A. Power Distribution, General:
  - 1. Current-limiting, with 200,000 ampere rms interrupting rating.
  - 2. Provide to fit mountings specified with switches.
  - 3. UL 248.
- B. Power Distribution, Ampere Ratings 1 Amp to 600 Amps:
  - 1. Class: RK-1.
  - 2. Type: Dual element, with time delay.
  - 3. Manufacturers and Products:
    - a. Bussmann; Types LPS-RK (600 volts) and LPN-RK (250 volts).
    - b. Littelfuse; Types LLS-RK (600 volts) and LLN-RK (250 volts).
- C. Cable Limiters:
  - 1. 600V or less; crimp to copper cable, bolt to bus or terminal pad.
  - 2. Manufacturer and Product: Bussmann; K Series.
- D. Ferrule:
  - 1. 600V or less, rated for applied voltage, small dimension.
  - 2. Ampere Ratings: 1/10 amp to 30 amps.
  - 3. Dual-element time-delay, time-delay, or nontime-delay as required.
  - 4. Provide with blocks or holders as indicated and suitable for location and use.
  - 5. Manufacturers:
    - a. Bussmann.
    - b. Littlefuse, Inc.

## 2.05 TERMINAL BLOCK, 600 VOLTS

- A. UL 486E and UL 1059.
- B. Size components to allow insertion of necessary wire sizes.
- C. Capable of termination of control circuits entering or leaving equipment, panels, or boxes.

- D. Screw clamp compression, dead front barrier type, with current bar providing direct contact with wire between compression screw and yoke.
- E. Yoke, current bar, and clamping screw of high strength and high conductivity metal.
- F. Yoke shall guide all strands of wire into terminal.
- G. Current bar shall ensure vibration-proof connection.
- H. Terminals:
  - 1. Capable of wire connections without special preparation other than stripping.
  - 2. Capable of jumper installation with no loss of terminal or rail space.
  - 3. Individual, rail mounted.
- I. Marking system, allowing use of preprinted or field-marked tags.
- J. Manufacturers:
  - 1. Weidmuller, Inc.
  - 2. Ideal.
  - 3. Electrovert USA Corp.

## 2.06 SUPPORT AND FRAMING CHANNELS

- A. Carbon Steel Framing Channel:
  - 1. Material: Rolled, mild strip steel, 12-gauge minimum, ASTM A1011/A1011M, Grade 33.
  - 2. Finish: Hot-dip galvanized after fabrication.
- B. Paint Coated Framing Channel: Carbon steel framing channel with electrodeposited rust inhibiting acrylic or epoxy paint.
- C. PVC-Coated Framing Channel: Carbon steel framing channel with 40-mil polyvinyl chloride coating.
- D. Stainless Steel Framing Channel: Rolled, Type 316 stainless steel, 12-gauge minimum.
- E. Extruded Aluminum Framing Channel:
  - 1. Material: Extruded from Type 6063-T6 aluminum alloy.
  - 2. Fittings fabricated from Alloy 5052-H32.

- F. Nonmetallic Framing Channel:
  - 1. Material: Fire retardant, fiber reinforced vinyl ester resin.
  - 2. Channel fitting of same material as channel.
  - 3. Nuts and bolts of long glass fiber reinforced polyurethane.

## G. Manufacturers:

- 1. B-Line Systems, Inc.
- 2. Unistrut Corp.
- 3. Aickinstrut.

#### 2.07 FIRESTOPS

- A. General:
  - 1. Provide UL 1479 classified hourly fire rating equal to, or greater than, the assembly penetrated.
  - 2. Prevent the passage of cold smoke, toxic fumes, and water before and after exposure to flame.
  - 3. Sealants and accessories shall have fire-resistance ratings as established by testing identical assemblies in accordance with ASTM E814, by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
- B. Firestop System:
  - 1. Formulated for use in through-penetration firestopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors.
  - 2. Fill, Void, or Cavity Material: 3M Brand Fire Barrier Caulk CP25, Putty 303, Wrap/Strip FS195, Composite Sheet CS195 and Penetration Sealing Systems 7902 and 7904 Series.
  - 3. Two-Part, Foamed-In-Place, Silicone Sealant: Dow Corning Corp. Fire Stop Foam, General Electric Co. Pensil 851.
  - 4. Fire Stop Devices: See Section 26 05 33, Raceway and Boxes, for raceway and cable fittings.

#### 2.08 ENCLOSURES

- A. Finish: Sheet metal structural and enclosure parts shall be completely painted using an electrodeposition process so interior and exterior surfaces as well as bolted structural joints have a complete finish coat on and between them.
- B. Color: Manufacturer's standard color (gray) baked-on enamel, unless otherwise shown.

- C. Barriers: Provide metal barriers within enclosures to separate wiring of different systems and voltage.
- D. Enclosure Selections:

Enclosures					
Indoor	Finished	Dry	1		
Indoor	Unfinished	Dry	1		
Indoor	Unfinished	Industrial Use	12		
Indoor and Outdoor	Any	Wet	4		
Indoor and Outdoor	Any	Denoted "WP"	3R		

1. Except as shown otherwise, provide electrical enclosures according to the following table:

## PART 3 EXECUTION

#### 3.01 GENERAL

A. Install equipment in accordance with manufacturer's recommendations.

#### 3.02 SUPPORT AND FRAMING CHANNEL

- A. Install where required for mounting and supporting electrical equipment, raceway, and cable tray systems.
- B. Channel Type:
  - 1. Interior, Wet or Dry (Noncorrosive) Locations:
    - a. PVC-Coated Conduit: PVC coated.
    - b. Steel Raceway and Other Systems Not Covered: Carbon steel or paint coated.
  - 2. Outdoor, Noncorrosive Locations:
    - a. Steel Raceway: Carbon steel or paint coated framing channel, except where mounted on aluminum handrail, then use aluminum framing channel.
    - b. Aluminum Raceway and Other Systems Not Covered: Aluminum framing channel or carbon steel with neoprene material isolators.
  - 3. Aluminum Railings: Devices mounted on aluminum railing shall use aluminum framing channel.

- C. Paint cut ends prior to installation with the following:
  - 1. Carbon Steel Channel: Zinc-rich primer.
  - 2. Painted Channel: Rust-inhibiting epoxy or acrylic paint.
  - 3. Nonmetallic Channel: Epoxy resin sealer.
  - 4. PVC-Coated Channel: PVC patch.

#### 3.03 FIRESTOPS

- A. Install in strict conformance with manufacturer's instructions. Comply with installation requirements established by testing and inspecting agency.
- B. Sealant: Install sealant including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide firestops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs.

## **END OF SECTION**

## SECTION 26 05 05 CONDUCTORS

## PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. ASTM International (ASTM):
    - a. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
    - b. B3, Standard Specification for Soft or Annealed Copper Wire.
    - c. B8, Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
    - d. B496, Standard Specification for Compact Round Concentric-Lay-Stranded Copper Conductors.
  - 2. Insulated Cable Engineer's Association, Inc. (ICEA):
    - a. S-58-679, Standard for Control Cable Conductor Identification.
    - b. S-73-532, Standard for Control Thermocouple Extensions and Instrumentation Cables.
    - c. T-29-520, Conducting Vertical Cable Tray Flame Tests with Theoretical Heat Input of 210,000 Btu/hour.
  - 3. National Electrical Manufacturers' Association (NEMA):
    - a. WC 57, Standard for Control, Thermocouple Extension, and Instrumentation Cables.
    - b. WC 70, Standard for Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
  - 4. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
    - b. 262, Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
  - 5. Telecommunications Industry Association (TIA): TIA-568-C,
    - Commercial Building Telecommunications Cabling Standard. UL:
      - a. 13, Standard for Safety for Power-Limited Circuit Cables.
      - b. 44, Standard for Safety for Thermoset-Insulated Wires and Cables.
      - c. 62, Standard for Safety for Flexible Cord and Cables.
      - d. 486A-486B, Standard for Safety for Wire Connectors.
      - e. 486C, Standard for Safety for Splicing Wire Connectors.
      - f. 510, Standard for Safety for Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape.
      - g. 854, Standard for Safety for Service-Entrance Cables.

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- h. 1569, Standard for Safety for Metal-Clad Cables.
- i. 1581, Standard for Safety for Reference Standard for Electrical Wires, Cables, and Flexible Cords.

## 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data:
    - a. Wire and cable.
    - b. Wire and cable accessories.

## 1.03 QUALITY ASSURANCE

- A. Authority Having Jurisdiction (AHJ):
  - 1. Provide the Work in accordance with NFPA 70. Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
  - 2. Materials and equipment manufactured within the scope of standards published by UL shall conform to those standards and shall have an applied UL listing mark.

## PART 2 PRODUCTS

## 2.01 CONDUCTORS 600 VOLTS AND BELOW

- A. Conform to applicable requirements of NEMA WC 70.
- B. Conductor Type:
  - 1. 120-Volt and 277-Volt Lighting, 10 AWG and Smaller: Solid copper.
  - 2. 120-Volt Receptacle Circuits, 10 AWG and Smaller: Solid copper.
  - 3. All Other Circuits: Stranded copper.
- C. Insulation: Type THHN/THWN-2, except for sizes No. 6 and larger, with XHHW-2 insulation.

## 2.02 300-VOLT RATED CABLE

- A. General:
  - 1. Type PLTC, meeting requirements of UL 13 and NFPA 70, Article 725.
  - 2. Permanently and legibly marked with manufacturer's name, maximum working voltage for which cable was tested, type of cable, and UL listing mark.

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- 3. Suitable for installation in open air, in cable trays, or conduit.
- 4. Minimum Temperature Rating: 105 degrees C.
- 5. Passes Vertical Tray Flame Test.
- 6. Outer Jacket: PVC, flame-retardant, sunlight- and oil-resistant.
- B. Type 24, Twisted Pair Fire Alarm Cable Shielded: Power limited fire protective signaling circuit cable meeting requirements of NFPA 70, Article 760.
  - 1. Cable: Pass NFPA 262, 70,000 Btu flame test.
  - 2. Outer Jacket: Red in color, identified along its entire length as fire protective signaling circuit cable.
  - 3. Conductors:
    - a. Solid, tinned, or bare copper shielded, with stranded tinned copper drain wire.
    - b. Insulation: 15-mil PVC.
  - 4. Cable Sizes:

Wire Size	Maximum Outside Diameter (Inches)	Nominal Jacket Thickness (Inches)
12	0.36	0.042
14	0.32	0.042
16	0.26	0.037
18	0.23	0.037

- 5. Manufacturers:
  - a. West Penn Wire.
  - b. Coleman Cable, Inc.

#### 2.03 SPECIAL CABLES

- A. Type 30, Unshielded Twisted Pair (UTP) Telephone and Data Cable, 300V:
  - 1. Category 6 UTP, UL listed, and third party verified to comply with TIA/EIA 568-C Category 6 requirements.
  - 2. Suitable for high speed network applications including gigabit ethernet and video. Cable shall be interoperable with other standards compliant products and shall be backward compatible with Category 5 and Category 5e.
  - 3. Provide four each individually twisted pair, 23 AWG conductors, with FEP insulation and blue PVC jacket.
  - 4. NFPA 70 Plenum (CMP) rated; comply with flammability plenum requirements of NFPA 70 and NFPA 262.

- 5. Cable shall withstand a bend radius of 1-inch minimum at a temperature of minus 20 degrees C maximum without jacket or insulation cracking.
- 6. Manufacturer and Product: Belden; 7852A.

## 2.04 GROUNDING CONDUCTORS

A. Equipment: Stranded copper with green, Type USE/RHH/RHW-XLPE or THHN/THWN, insulation.

## 2.05 ACCESSORIES FOR CONDUCTORS 600 VOLTS AND BELOW

## A. Tape:

- General Purpose, Flame Retardant: 7-mil, vinyl plastic, Scotch Brand 33+, rated for 90 degrees C minimum, meeting requirements of UL 510.
- 2. Flame Retardant, Cold and Weather Resistant: 8.5-mil, vinyl plastic, Scotch Brand 88.
- 3. Arc and Fireproofing:
  - a. 30-mil, elastomer.
  - b. Manufacturers and Products:
    - 1) 3M; Scotch Brand 77, with Scotch Brand 69 glass cloth tapebinder.
    - 2) Plymouth; 53 Plyarc, with 77 Plyglas glass cloth tapebinder.

#### B. Identification Devices:

- 1. Sleeve:
  - a. Permanent, PVC, yellow or white, with legible machine-printed black markings.
  - b. Manufacturers and Products:
    - 1) Raychem; Type D-SCE or ZH-SCE.
    - 2) Brady, Type 3PS.
- 2. Heat Bond Marker:
  - a. Transparent thermoplastic heat bonding film with acrylic pressure sensitive adhesive.
  - b. Self-laminating protective shield over text.
  - c. Machine printed black text.
  - d. Manufacturer and Product: 3M Co.; Type SCS-HB.
- 3. Marker Plate: Nylon, with legible designations permanently hot stamped on plate.
- 4. Tie-On Cable Marker Tags:
  - a. Chemical-resistant white tag.
  - b. Size: 1/2 inch by 2 inches.
  - c. Manufacturer and Product: Raychem; Type CM-SCE.

- 5. Grounding Conductor: Permanent green heat-shrink sleeve, 2-inch minimum.
- C. Connectors and Terminations:
  - 1. Nylon, Self-Insulated Crimp Connectors:
    - a. Manufacturers and Products:
      - 1) Thomas & Betts; Sta-Kon.
      - 2) Burndy; Insulug.
      - 3) ILSCO.
  - 2. Nylon, Self-Insulated, Crimp Locking-Fork, Torque-Type Terminator:
    - a. Suitable for use with 75 degrees C wire at full NFPA 70,
      - 75 degrees C ampacity.
    - b. Seamless.
    - c. Manufacturers and Products:
      - 1) Thomas & Betts; Sta-Kon.
      - 2) Burndy; Insulink.
      - 3) ILSCO; ILSCONS.
  - 3. Self-Insulated, Freespring Wire Connector (Wire Nuts):
    - a. UL 486C.
    - b. Plated steel, square wire springs.
    - c. Manufacturers and Products:
      - 1) Thomas & Betts.
      - 2) Ideal; Twister.
  - 4. Self-Insulated, Set Screw Wire Connector:
    - a. Two piece compression type with set screw in brass barrel.
    - b. Insulated by insulator cap screwed over brass barrel.
    - c. Manufacturers:
      - 1) 3M Co.
      - 2) Thomas & Betts.
      - 3) Marrette.
- D. Cable Lugs:
  - 1. In accordance with NEMA CC 1.
  - 2. Rated 600 volts of same material as conductor metal.
  - 3. Uninsulated Crimp Connectors and Terminators:
    - a. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
    - b. Manufacturers and Products:
      - 1) Thomas & Betts; Color-Keyed.
      - 2) Burndy; Hydent.
      - 3) ILSCO.

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- 4. Uninsulated, Bolted, Two-Way Connectors and Terminators:a. Manufacturers and Products:
  - 1) Thomas & Betts; Locktite.
  - 2) Burndy; Quiklug.
  - 3) ILSCO.
- E. Cable Ties:
  - 1. Nylon, adjustable, self-locking, and reusable.
  - 2. Manufacturer and Product: Thomas & Betts; TY-RAP.
- F. Heat Shrinkable Insulation:
  - 1. Thermally stabilized cross-linked polyolefin.
  - 2. Single wall for insulation and strain relief.
  - 3. Dual Wall, adhesive sealant lined, for sealing and corrosion resistance.
  - 4. Manufacturers and Products:
    - a. Thomas & Betts; SHRINK-KON.
    - b. Raychem; RNF-100 and ES-2000.
- G. Data Cable Accessories: Terminators, connectors, and junctions necessary for a complete system.

#### 2.06 PULLING COMPOUND

- A. Nontoxic, noncorrosive, noncombustible, nonflammable, water-based lubricant; UL listed.
- B. Suitable for rubber, neoprene, PVC, polyethylene, hypalon, CPE, and lead-covered wire and cable.
- C. Approved for intended use by cable manufacturer.
- D. Suitable for zinc-coated steel, aluminum, PVC, bituminized fiber, and fiberglass raceways.
- E. Manufacturers:
  - 1. Ideal Co.
  - 2. Polywater, Inc.
  - 3. Cable Grip Co.

#### 2.07 SOURCE QUALITY CONTROL

A. Conductors 600 Volts and Below: Test in accordance with UL 44 and UL 854.

# PART 3 EXECUTION

#### 3.01 GENERAL

- A. Conductor installation shall be in accordance with manufacturer's recommendations.
- B. Conductor and cable sizing shown is based on copper conductors, unless noted otherwise.
- C. Do not exceed cable manufacturer's recommendations for maximum pulling tensions and minimum bending radii.
- D. Terminate conductors and cables, unless otherwise indicated.
- E. Tighten screws and terminal bolts in accordance with UL 486A-486B for copper conductors and aluminum conductors.
- F. Cable Lugs: Provide with correct number of holes, bolt size, and center-tocenter spacing as required by equipment terminals.
- G. Bundling: Where single conductors and cables in manholes, handholes, vaults, cable trays, and other indicated locations are not wrapped together by some other means, bundle conductors from each conduit throughout their exposed length with cable ties placed at intervals not exceeding 12 inches on center.
- H. Ream, remove burrs, and clear interior of installed conduit before pulling wires or cables.

## 3.02 POWER CONDUCTOR COLOR CODING

- A. Conductors 600 Volts and Below:
  - 1. 6 AWG and Larger: Apply general purpose, flame retardant tape at each end, and at accessible locations wrapped at least six full overlapping turns, covering area 1-1/2 inches to 2 inches wide.
  - 2. 8 AWG and Smaller: Provide colored conductors.
  - 3. Colors:

System	Conductor	Color
All Systems	Equipment Grounding	Green
240/120 Volts, Single-Phase, Three- Wire	Grounded Neutral One Hot Leg Other Hot Leg	White Black Red

## CCDC PARKING CAPITOL/MYRTLE GARAGE ELEVATOR #4 MODERNIZATION

System	Conductor	Color
208Y/120 Volts, Three-Phase, Four- Wire	Grounded Neutral Phase A Phase B Phase C	White Black Red Blue
480Y/277 Volts, Three-Phase, Four- Wire	Grounded Neutral Phase A Phase B Phase C	White Brown Orange Yellow

Note: Phase A, B, C implies direction of positive phase rotation.

4. Tracer: Outer covering of white with identifiable colored strip, other than green, in accordance with NFPA 70.

#### 3.03 CIRCUIT IDENTIFICATION

- A. Identify power, instrumentation, and control conductor circuits at each termination, and in accessible locations such as manholes, handholes, panels, switchboards, motor control centers, pull boxes, and terminal boxes.
- B. Circuits Appearing in Circuit Schedules: Identify using circuit schedule designations.
- C. Circuits Not Appearing in Circuit Schedules:
  - 1. Assign circuit name based on device or equipment at load end of circuit.
  - 2. Where this would result in same name being assigned to more than one circuit, add number or letter to each otherwise identical circuit name to make it unique.
- D. Method:
  - 1. Conductors 3 AWG and Smaller: Identify with sleeves or heat bond markers.
  - 2. Cables and Conductors 2 AWG and Larger:
    - a. Identify with marker plates or tie-on cable marker tags.
    - b. Attach with nylon tie cord.
  - 3. Taped-on markers or tags relying on adhesives not permitted.

#### 3.04 CONDUCTORS 600 VOLTS AND BELOW

A. Install 10 AWG or 12 AWG conductors for branch circuit power wiring in lighting and receptacle circuits.

- B. Do not splice incoming service conductors and branch power distribution conductors 6 AWG and larger, unless specifically indicated or approved by Engineer.
- C. Connections and Terminations:
  - 1. Install wire nuts only on solid conductors. Wire nuts are not allowed on stranded conductors.
  - 2. Install nylon self-insulated crimp connectors and terminators for instrumentation and control, circuit conductors.
  - 3. Install self-insulated, set screw wire connectors for two-way connection of power circuit conductors 12 AWG and smaller.
  - 4. Install uninsulated crimp connectors and terminators for instrumentation, control, and power circuit conductors 4 AWG through 2/0 AWG.
  - 5. Install uninsulated, bolted, two-way connectors and terminators for power circuit conductors 3/0 AWG and larger.
  - 6. Install uninsulated terminators bolted together on motor circuit conductors 10 AWG and larger.
  - 7. Place no more than one conductor in any single-barrel pressure connection.
  - 8. Install crimp connectors with tools approved by connector manufacturer.
  - 9. Install terminals and connectors acceptable for type of material used.
  - 10. Compression Lugs:
    - a. Attach with a tool specifically designed for purpose. Tool shall provide complete, controlled crimp and shall not release until crimp is complete.
    - b. Do not use plier type crimpers.
- D. Do not use soldered mechanical joints.
- E. Splices and Terminations:
  - 1. Insulate uninsulated connections.
  - 2. Indoors: Use general purpose, flame retardant, tape or single wall heat shrink.
  - 3. Outdoors, Dry Locations: Use flame retardant, cold- and weather-resistant tape or single wall heat shrink.
  - 4. Below Grade and Wet or Damp Locations: Use dual wall heat shrink.
- F. Cap spare conductors with UL listed end caps.

- G. Cabinets, Panels, and Motor Control Centers:
  - 1. Remove surplus wire, bridle and secure.
  - 2. Where conductors pass through openings or over edges in sheet metal, remove burrs, chamfer edges, and install bushings and protective strips of insulating material to protect the conductors.
- H. Control and Instrumentation Wiring:
  - 1. Where terminals provided will accept such lugs, terminate control and instrumentation wiring, except solid thermocouple leads, with insulated, locking-fork compression lugs.
  - 2. Terminate with methods consistent with terminals provided, and in accordance with terminal manufacturer's instructions.
  - 3. Locate splices in readily accessible cabinets or junction boxes using terminal strips.
- I. Extra Conductor Length: For conductors to be connected by others, install minimum 6 feet of extra conductor in freestanding panels and minimum 2 feet in other assemblies.

## 3.05 CONDUCTOR ARC AND FIREPROOFING

- A. Install arc and fireproofing tape on 600-volt single conductors and cables, except those rated Type TC at splices in manholes, handholes, vaults, cable trays, and other indicated locations.
- B. Wrap conductors of same circuit entering from separate conduit together as single cable.
- C. Follow tape manufacturer's installation instructions.

## **END OF SECTION**

## SECTION 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. Institute of Electrical and Electronics Engineers (IEEE): C2, National Electrical Safety Code (NESC).
  - 2. National Fire Protection Association (NFPA): 70, National Electrical Code. (NEC).

#### 1.02 QUALITY ASSURANCE

- A. Authority Having Jurisdiction (AHJ):
  - 1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, provide material and equipment labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ to provide a basis for approval under NEC.
  - 2. Materials and equipment manufactured within the scope of standards published by UL:
    - a. Confirm conformance with UL standards.
    - b. Supply with an applied UL listing mark.

#### PART 2 PRODUCTS

- 2.01 GROUND CONDUCTORS
  - A. As specified in Section 26 05 05, Conductors.

#### 2.02 CONNECTORS

- A. Exothermic Weld Type:
  - 1. Outdoor Weld: Suitable for exposure to elements or direct burial.
  - 2. Indoor Weld: Use low-smoke, low-emission process.
  - 3. Manufacturers:
    - a. Erico Products, Inc.
    - b. Thermoweld.

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## B. Compression Type:

- 1. Compress-deforming type; wrought copper extrusion material.
- 2. Single indentation for conductors 6 AWG and smaller.
- 3. Double indentation with extended barrel for conductors 4 AWG and larger.
- 4. Barrels prefilled with oxide-inhibiting and antiseizing compound and sealed.
- 5. Manufacturers:
  - a. Burndy Corp.; Hyground Irreversible Compression.
  - b. Thomas and Betts Co.
  - c. ILSCO.
- C. Mechanical Type: Split-bolt, saddle, or cone screw type; copper alloy material.
  - 1. Manufacturers:
    - a. Burndy Corp.
    - b. Thomas and Betts Co.

## PART 3 EXECUTION

- 3.01 GENERAL
  - A. Grounding: In compliance with NFPA 70 and IEEE C2.
  - B. Ground electrical service neutral at service entrance equipment with grounding electrode conductor to grounding electrode system.
  - C. Ground each separately derived system neutral with common grounding electrode conductor to grounding electrode system.
  - D. Bond together all grounding electrodes that are present at each building or structure served to form one common grounding electrode system.
  - E. Bond together system neutrals, service equipment enclosures, exposed noncurrent-carrying metal parts of electrical equipment, metal raceways, ground conductor in raceways and cables, receptacle ground connections, and metal piping systems.

#### 3.02 WIRE CONNECTIONS

A. Ground Conductors: Install in conduit containing power conductors and control circuits above 50 volts.

- B. Nonmetallic Raceways and Flexible Tubing: Install equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.
- C. Connect ground conductors to raceway grounding bushings.
- D. Extend and connect ground conductors to ground bus in all equipment containing a ground bus.
- E. Connect enclosure of equipment containing ground bus to that bus.
- F. Bolt connections to equipment ground bus.
- G. Bond grounding conductors to metallic enclosures at each end, and to intermediate metallic enclosures.
- H. Junction Boxes: Furnish materials and connect to equipment grounding system with grounding clips mounted directly on box, or with 3/8-inch machine screws.
- I. Metallic Equipment Enclosures: Use furnished ground lug; if none furnished, tap equipment housing and install solderless terminal connected to box with machine screw. For circuits greater than 20 amps use minimum 5/16-inch diameter bolt.

#### 3.03 MOTOR GROUNDING

- A. Extend equipment ground bus via grounding conductor installed in motor feeder raceway; connect to motor frame.
- B. Nonmetallic Raceways and Flexible Tubing: Install an equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.
- C. Motors Less Than 10 hp: Use furnished ground lug in motor connection box. If none furnished, provide compression, spade-type terminal connected to conduit box mounting screw.
- D. Circuits 20 Amps or Above: Tap motor frame or equipment housing. Install solderless terminal with minimum 5/16-inch diameter bolt.

## 3.04 CONNECTIONS

- A. General:
  - 1. Abovegrade Connections: Install exothermic weld, mechanical, or compression-type connectors; or brazing.
  - 2. Remove paint, dirt, or other surface coverings at connection points to allow good metal-to-metal contact.

- B. Exothermic Weld Type:
  - 1. Wire brush or file contact point to bare metal surface.
  - 2. Use welding cartridges and molds in accordance with manufacturer's recommendations.
  - 3. Avoid using badly worn molds.
  - 4. Mold to be completely filled with metal when making welds.
  - 5. After completed welds have cooled, brush slag from weld area and thoroughly clean joint.
- C. Compression Type:
  - 1. Install in accordance with connector manufacturer's recommendations.
  - 2. Install connectors of proper size for grounding conductors and ground rods specified.
  - 3. Install using connector manufacturer's compression tool having proper sized dies and operate per manufacturer's instructions.
- D. Mechanical Type:
  - 1. Apply homogeneous blend of colloidal copper and rust and corrosion inhibitor before making connection.
  - 2. Install in accordance with connector manufacturer's recommendations.
  - 3. Do not conceal mechanical connections.

#### 3.05 METAL STRUCTURE GROUNDING

- A. Bond metal sheathing and exposed metal vertical structural elements to grounding system.
- B. Bond electrical equipment supported by metal platforms to the platforms.
- C. Provide electrical contact between metal frames and railings supporting pushbutton stations, receptacles, and instrument cabinets, and raceways carrying circuits to these devices.

#### 3.06 TRANSFORMER GROUNDING

A. Bond neutrals of transformers within buildings to system ground network and to any additional indicated grounding electrodes.

#### 3.07 SURGE PROTECTION EQUIPMENT GROUNDING

A. Connect surge arrestor ground terminals to equipment ground bus.

## **END OF SECTION**
## SECTION 26 05 33 RACEWAY AND BOXES

### PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. American Association of State Highway and Transportation Officials (AASHTO): HB, Standard Specifications for Highway Bridges.
  - 2. ASTM International (ASTM):
    - a. A123/123M, Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
    - b. A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
    - c. A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
    - d. C857, Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
    - e. D149, Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
  - 3. Telecommunications Industry Association (TIA): 569B, Commercial Building Standard for Telecommunications Pathways and Spaces.
  - 4. National Electrical Contractor's Association, Inc. (NECA): Installation standards.
  - 5. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. C80.1, Electrical Rigid Steel Conduit (ERSC).
    - c. C80.3, Steel Electrical Metallic Tubing (EMT).
    - d. C80.5, Electrical Rigid Aluminum Conduit (ERAC).
    - e. C80.6, Electrical Intermediate Metal Conduit (EIMC).
    - f. RN 1, Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
    - g. TC 2, Electrical Polyvinyl Chloride (PVC) Conduit.
    - h. TC 3, Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing.
    - i. TC 6, Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation.
    - j. TC 14, Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
    - k. VE 1, Metallic Cable Tray Systems.

- 6. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
- 7. UL:
  - a. 1, Standard for Safety for Flexible Metal Conduit.
  - b. 5, Standard for Safety for Surface Metal Raceways and Fittings.
  - c. 6, Standard for Safety for Electrical Rigid Metal Conduit Steel.
  - d. 6A, Standard for Safety for Electrical Rigid Metal Conduit Aluminum, Red Brass and Stainless.
  - e. 360, Standard for Safety for Liquid-Tight Flexible Steel Conduit.
  - f. 514B, Standard for Safety for Conduit, Tubing, and Cable Fittings.
  - g. 651, Standard for Safety for Schedule 40 and 80 Rigid PVC Conduit and Fittings.
  - h. 651A, Standard for Safety for Type EB and A Rigid PVC Conduit and HDPE Conduit.
  - i. 797, Standard for Safety for Electrical Metallic Tubing Steel.
  - j. 870, Standard for Safety for Wireways, Auxiliary Gutters, and Associated Fittings.
  - k. 1242, Standard for Safety for Electrical Intermediate Metal Conduit – Steel.
  - 1. 1660, Standard for Safety for Liquid-Tight Flexible Nonmetallic Conduit.
  - m. 1684, Standard for Safety for Reinforced Thermosetting Resin Conduit (RTRC) and Fittings.
  - n. 2024, Standard for Safety for Optical Fiber and Communication Cable Raceway.

### 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Manufacturer's Literature:
    - a. Rigid galvanized steel conduit.
    - b. Intermediate metal conduit.
    - c. Electric metallic tubing.
    - d. Flexible metal, liquid-tight conduit.
    - e. Flexible, nonmetallic, liquid-tight conduit.
    - f. Flexible metal, nonliquid-tight conduit.
    - g. Conduit fittings.
    - h. Wireways.
    - i. Large junction and pull boxes.
    - j. Terminal junction boxes.

## 1.03 QUALITY ASSURANCE

- A. Authority Having Jurisdiction (AHJ):
  - 1. Provide the Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, material and equipment shall be labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ in order to provide a basis for approval under NEC.
  - 2. Materials and equipment manufactured within scope of standards published by UL shall conform to those standards and shall have an applied UL listing mark.

## PART 2 PRODUCTS

### 2.01 CONDUIT AND TUBING

- A. Rigid Galvanized Steel Conduit (RGS):
  - 1. Meet requirements of NEMA C80.1 and UL 6.
  - 2. Material: Hot-dip galvanized with chromated protective layer.
- B. Intermediate Metal Conduit (IMC):
  - 1. Meet requirements of NEMA C80.6 and UL 1242.
  - 2. Material: Hot-dip galvanized with chromated and lacquered protective layer.
- C. Electric Metallic Tubing (EMT):
  - 1. Meet requirements of NEMA C80.3 and UL 797.
  - 2. Material: Hot-dip galvanized with chromated and lacquered protective layer.
- D. Flexible Metal, Liquid-Tight Conduit:
  - 1. UL 360 listed for 105 degrees C insulated conductors.
  - 2. Material: Galvanized steel with extruded PVC jacket.
- E. Flexible Metal, Nonliquid-Tight Conduit:
  - 1. Meet requirements of UL 1.
  - 2. Material: Galvanized steel.

- F. Flexible, Nonmetallic, Liquid-Tight Conduit:
  - 1. Material: PVC core with fused flexible PVC jacket.
  - 2. UL 1660 listed for:
    - a. Dry Conditions: 80 degrees C insulated conductors.
    - b. Wet Conditions: 60 degrees C insulated conductors.
  - 3. Manufacturers and Products:
    - a. Carlon; Carflex or X-Flex.
    - b. T & B; Xtraflex LTC or EFC.

## 2.02 FITTINGS

- A. Rigid Galvanized Steel and Intermediate Metal Conduit:
  - 1. General:
    - a. Meet requirements of UL 514B.
    - b. Type: Threaded, galvanized. Set screw and threadless compression fittings not permitted.
  - 2. Bushing:
    - a. Material: Malleable iron with integral insulated throat, rated for 150 degrees C.
    - b. Manufacturers and Products:
      - 1) Appleton; Series BU-I.
      - 2) O-Z/Gedney; Type HB.
  - 3. Grounding Bushing:
    - a. Material: Malleable iron with integral insulated throat rated for 150 degrees C, with solderless lugs.
    - b. Manufacturers and Products:
      - 1) Appleton; Series GIB.
      - 2) O-Z/Gedney; Type HBLG.
  - 4. Conduit Hub:
    - a. Material: Malleable iron with insulated throat with bonding screw.
    - b. UL listed for use in wet locations.
    - c. Manufacturers and Products:
      - 1) Appleton, Series HUB-B.
      - 2) O-Z/Gedney; Series CH.
      - 3) Meyers; ST Series.
  - 5. Conduit Bodies:
    - a. Sized as required by NFPA 70.
    - b. Manufacturers and Products (For Normal Conditions):
      - 1) Appleton; Form 35 threaded unilets.
      - 2) Crouse-Hinds; Form 7 or Form 8 threaded condulets.
      - 3) Killark; Series O electrolets.
      - 4) Thomas & Betts; Form 7 or Form 8.
  - 6. Couplings: As supplied by conduit manufacturer.

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- 7. Unions:
  - a. Concrete tight, hot-dip galvanized malleable iron.
  - b. Manufacturers and Products:
    - 1) Appleton; Series SCC bolt-on coupling or Series EC threepiece union.
    - 2) O-Z/Gedney; Type SSP split coupling or Type 4 Series, three-piece coupling.
- 8. Conduit Sealing Fitting:
  - a. Manufacturers and Products:
    - 1) Appleton; Type EYF, EYM, or ESU.
    - 2) Crouse-Hinds; Type EYS or EZS.
    - 3) Killark; Type EY or Type EYS.
- 9. Drain Seal:
  - a. Manufacturers and Products:
    - 1) Appleton; Type EYD.
    - 2) Crouse-Hinds; Type EYD or Type EZD.
- 10. Drain/Breather Fitting:
  - a. Manufacturers and Products:
    - 1) Appleton; Type ECDB.
    - 2) Crouse-Hinds; ECD.
- 11. Expansion Fitting:
  - a. Manufacturers and Products:
    - 1) Deflection/Expansion Movement:
      - a) Appleton; Type DF.
      - b) Crouse-Hinds; Type XD.
    - 2) Expansion Movement Only:
      - a) Appleton; Type XJ.
      - b) Crouse-Hinds; Type XJ.
      - c) Thomas & Betts; XJG-TP.
- 12. Cable Sealing Fitting:
  - a. To form watertight nonslip cord or cable connection to conduit.
  - b. For Conductors with OD of 1/2 inch or Less: Neoprene bushing at connector entry.
  - c. Manufacturers and Products:
    - 1) Appleton; CG-S.
    - 2) Crouse-Hinds; CGBS.
- B. Electric Metallic Tubing:
  - 1. Meet requirements of UL 514B.
  - 2. Type: Steel body and locknuts with steel or malleable iron compression nuts. Set screw and drive-on fittings not permitted.
  - 3. Electro zinc-plated inside and out.
  - 4. Raintight.

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- 5. Coupling Manufacturers and Products:
  - a. Appleton; Type 95T.
  - b. Crouse-Hinds.
  - c. Thomas & Betts.
- 6. Connector Manufacturers and Products:
  - a. Appleton; Type ETP.
  - b. Crouse-Hinds.
  - c. Thomas & Betts.
- C. Flexible Metal, Liquid-Tight Conduit:
  - 1. Metal insulated throat connectors with integral nylon or plastic bushing rated for 105 degrees C.
  - 2. Insulated throat and sealing O-rings.
  - 3. Manufacturers and Products:
    - a. Thomas & Betts; Series 5331.
    - b. O-Z/Gedney; Series 4Q.
- D. Flexible Metal, Nonliquid-Tight Conduit:
  - 1. Meet requirements of UL 514B.
  - 2. Body: Galvanized steel or malleable iron.
  - 3. Throat: Nylon insulated.
  - 4. 1-1/4-Inch Conduit and Smaller: One screw body.
  - 5. 1-1/2-Inch Conduit and Larger: Two screw body.
  - 6. Manufacturer and Product: Appleton; Series 7400.
- E. Flexible, Nonmetallic, Liquid-Tight Conduit:
  - 1. Meet requirements of UL 514B.
  - 2. Type: High strength plastic body, complete with lock nut, O-ring, threaded ferrule, sealing ring, and compression nut.
  - 3. Body/compression nut (gland) design to ensure high mechanical pullout strength and watertight seal.
  - 4. Manufacturers and Products:
    - a. Carlon; Type LT.
    - b. O-Z/Gedney; Type 4Q-P.
    - c. Thomas & Betts; Series 6300.
- F. Watertight Entrance Seal Device:
  - 1. New Construction:
    - a. Material: Oversized sleeve, malleable iron body with sealing ring, pressure ring, grommet seal, and pressure clamp.
    - b. Manufacturer and Product: O-Z/Gedney; Type FSK or Type WSK, as required.

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- 2. Cored-Hole Application:
  - a. Material: Assembled dual pressure disks, neoprene sealing ring, and membrane clamp.
  - b. Manufacturer and Product: O-Z/Gedney; Series CSM.

### 2.03 OUTLET AND DEVICE BOXES

- A. Sheet Steel: One-piece drawn type, zinc-plated or cadmium-plated.
- B. Cast Metal:
  - 1. Box: Malleable iron or Cast ferrous metal.
  - 2. Cover: Gasketed, weatherproof, malleable iron, or cast ferrous metal, with stainless steel screws.
  - 3. Hubs: Threaded.
  - 4. Lugs: Cast Mounting.
  - 5. Manufacturers and Products, Nonhazardous Locations:
    - a. Crouse-Hinds; Type FS or Type FD.
    - b. Appleton; Type FS or Type FD.
    - c. Killark.

### 2.04 JUNCTION AND PULL BOXES

- A. Outlet Box Used as Junction or Pull Box: As specified under Article Outlet and Device Boxes.
- B. Conduit Bodies Used as Junction Boxes: As specified under Article Fittings.
- C. Large Sheet Steel Box:
  - 1. NEMA 250, Type 1.
  - 2. Box: Code-gauge, galvanized steel.
  - 3. Cover: Full access, screw type.
  - 4. Machine Screws: Corrosion-resistant.

### 2.05 TELEPHONE AND DATA OUTLET

A. Provide outlet boxes and cover plates meeting requirements of TIA 569B.

### 2.06 TERMINAL JUNCTION BOX

- A. Cover: Hinged, unless otherwise shown.
- B. Interior Finish: Paint with white enamel or lacquer.

C. Terminal Blocks: Separate connection point for each conductor entering or leaving box.

#### 2.07 METAL WIREWAYS

- A. Meet requirements of UL 870.
- B. Type: Steel-enclosed, lay-in type.
- C. Cover: Removable, screw type.
- D. Rating: Indoor.
- E. Finish: Rust inhibiting phosphatizing primer and gray baked enamel.
- F. Hardware: Plated to prevent corrosion; screws installed toward the inside protected by spring nuts or otherwise guarded to prevent wire insulation damage.
- G. Knockouts: Without knockouts, unless otherwise indicated.
- H. Manufacturers:
  - 1. Circle AW.
  - 2. Hoffman.
  - 3. Square D.

### PART 3 EXECUTION

- 3.01 GENERAL
  - A. Conduit and tubing sizes shown are based on use of copper conductors.
  - B. Comply with NECA Installation Standards.
  - C. Crushed or deformed raceways not permitted.
  - D. Maintain raceway entirely free of obstructions and moisture.
  - E. Immediately after installation, plug or cap raceway ends with watertight and dust-tight seals until time for pulling in conductors.
  - F. Sealing Fittings: Provide drain seal in vertical raceways where condensate may collect above sealing fitting.
  - G. Avoid moisture traps where possible. When unavoidable in exposed conduit runs, provide junction box and drain fitting at conduit low point.

- H. Group raceways installed in same area.
- I. Proximity to Heated Piping: Install raceways minimum 12 inches from parallel runs.
- J. Follow structural surface contours when installing exposed raceways. Avoid obstruction of passageways.
- K. Run exposed raceways parallel or perpendicular to walls, structural members, or intersections of vertical planes.
- L. Block Walls: Do not install raceways in same horizontal course or vertical cell with reinforcing steel.
- M. Install watertight fittings in outdoor, underground, or wet locations.
- N. Paint threads and cut ends, before assembly of fittings, galvanized conduit, PVC-coated galvanized conduit, or IMC installed in exposed or damp locations with zinc-rich paint or liquid galvanizing compound.
- O. Metal conduit shall be reamed, burrs removed, and cleaned before installation of conductors, wires, or cables.
- P. Do not install raceways in concrete equipment pads, foundations, or beams without Engineer approval.
- Q. Horizontal raceways installed under floor slabs shall lie completely under slab, with no part embedded within slab.
- R. Install concealed, embedded, and buried raceways so that they emerge at right angles to surface and have no curved portion exposed.
- S. Install conduits for fiber optic cables, telephone cables, and Category 6 data cables in strict conformance with the requirements of TIA 569B.

### 3.02 REUSE OF EXISTING CONDUITS

- A. Where Drawings indicate existing conduits may be reused, they may be reused only where they meet the following criteria.
  - 1. Conduit is in useable condition with no deformation, corrosion, or damage to exterior surface.
  - 2. Conduit is sized per the NEC.
  - 3. Conduit is of the type specified in Contract Documents.
  - 4. Conduit is supported as specified in Contract Documents.

B. Conduit shall be reamed with wire brush, then with a mandrel approximately 1/4-inch smaller than raceway inside diameter then cleaned prior to pulling new conductors.

### 3.03 CONDUIT APPLICATION

- A. Diameter: Minimum 3/4-inch.
- B. Exterior, Exposed:
  - 1. Rigid galvanized steel.
  - 2. Intermediate metal.
- C. Interior, Exposed:
  - 1. Rigid galvanized steel.
  - 2. Intermediate metal.
  - 3. Electric metallic tubing where not subject to physical damage.
- D. Interior, Concealed (Not Embedded in Concrete):
  - 1. Rigid galvanized steel.
  - 2. Intermediate metal.
  - 3. Electric metallic tubing.

### 3.04 FLEXIBLE CONNECTIONS

- A. For motors, wall or ceiling mounted fans and unit heaters, dry type transformers, electrically operated valves, instrumentation, and other locations approved by Engineer where flexible connection is required to minimize vibration:
  - 1. Conduit Size 4 Inches or Less: Flexible, liquid-tight conduit.
  - 2. Conduit Size Over 4 Inches: Nonflexible.
  - 3. Wet or Corrosive Areas: Flexible, nonmetallic liquid-tight.
  - 4. Dry Areas: Flexible, metallic liquid-tight.
- B. Suspended Lighting Fixtures in Dry Areas: Flexible steel, nonliquid-tight conduit.
- C. Outdoor Areas, Process Areas Exposed to Moisture, and Areas Required to be Oiltight and Dust-Tight: Flexible metal, liquid-tight conduit.
- D. Flexible Conduit Length: 18 inches minimum, 60 inches maximum; sufficient to allow movement or adjustment of equipment.

### 3.05 PENETRATIONS

- A. Make at right angles, unless otherwise shown.
- B. Notching or penetration of structural members, including footings and beams, not permitted.
- C. Fire-Rated Walls, Floors, or Ceilings: Firestop openings around penetrations to maintain fire-resistance rating as specified in Section 26 05 04, Basic Electrical Materials and Methods.
- D. Concrete Walls, Floors, or Ceilings (Aboveground): Provide nonshrink grout dry-pack or use watertight seal device.
- E. Entering Structures:
  - 1. General: Seal raceway at first box or outlet with oakum or expandable plastic compound to prevent entrance of gases or liquids from one area to another.
  - 2. Concrete Roof or Membrane Waterproofed Wall or Floor:
    - a. Provide a watertight seal.
    - b. Without Concrete Encasement: Install watertight entrance seal device on each side.
    - c. With Concrete Encasement: Install watertight entrance seal device on accessible side.
    - d. Securely anchor malleable iron body of watertight entrance seal device into construction with one or more integral flanges.
    - e. Secure membrane waterproofing to watertight entrance seal device in a permanent, watertight manner.
  - 3. Heating, Ventilating, and Air Conditioning Equipment:
    - a. Penetrate equipment in area established by manufacturer.
    - b. Terminate conduit with flexible metal conduit at junction box or condulet attached to exterior surface of equipment prior to penetrating equipment.
    - c. Seal penetration with Type 5 sealant.

### 3.06 SUPPORT

- A. Support from structural members only, at intervals not exceeding NFPA 70 requirements. Do not exceed 8 feet in any application. Do not support from piping, pipe supports, or other raceways.
- B. Multiple Adjacent Raceways: Provide ceiling trapeze.

- C. Application/Type of Conduit Strap:
  - 1. Rigid Steel or EMT Conduit: Zinc coated steel, pregalvanized steel or malleable iron.
- D. Provide and attach wall brackets, strap hangers, or ceiling trapeze as follows:
  - 1. Wood: Wood screws.
  - 2. Hollow Masonry Units: Toggle bolts.
  - 3. Concrete or Brick: Expansion shields, or threaded studs driven in by powder charge, with lock washers and nuts.
  - 4. Steelwork: Machine screws.
  - 5. Location/Type of Hardware:
    - a. Dry, Noncorrosive Areas: Galvanized.
    - b. Wet, Noncorrosive Areas: Stainless steel.
- E. Nails or wooden plugs inserted in concrete or masonry for attaching raceway not permitted. Do not weld raceways or pipe straps to steel structures. Do not use wire in lieu of straps or hangers.
- F. Support aluminum conduit on concrete surfaces with stainless steel or nonmetallic spacers, or aluminum or nonmetallic framing channel.

### 3.07 BENDS

- A. Install concealed raceways with a minimum of bends in the shortest practical distance.
- B. Make bends and offsets of longest practical radius. Bends in conduits and ducts being installed for fiber optic cables shall be not less than 20 times cable diameter, 15 inches minimum.
- C. Install with symmetrical bends or cast metal fittings.
- D. Avoid field-made bends and offsets, but where necessary, make with acceptable hickey or bending machine. Do not heat metal raceways to facilitate bending.
- E. Make bends in parallel or banked runs from same center or centerline with same radius so that bends are parallel.
- F. Factory elbows may be installed in parallel or banked raceways if there is change in plane of run, and raceways are same size.

G. Flexible Conduit: Do not make bends that exceed allowable conductor bending radius of cable to be installed or that significantly restricts conduit flexibility.

## 3.08 EXPANSION/DEFLECTION FITTINGS

- A. Provide on raceways at structural expansion joints and in long tangential runs.
- B. Provide expansion/deflection joints for 25 degrees F maximum temperature variation.
- C. Install in accordance with manufacturer's instructions.

### 3.09 WIREWAYS

- A. Install in accordance with manufacturer's instructions.
- B. Locate with cover on accessible vertical face of wireway, unless otherwise shown.
- C. Applications: Metal wireway in indoor dry locations.

### 3.10 TERMINATION AT ENCLOSURES

- A. Cast Metal Enclosure: Install manufacturer's premolded insulating sleeve inside metallic conduit terminating in threaded hubs.
- B. Sheet Metal Boxes, Cabinets, and Enclosures:
  - 1. General:
    - a. Install insulated bushing on ends of conduit where grounding is not required.
    - b. Provide insulated throat when conduit terminates in sheet metal boxes having threaded hubs.
    - c. Utilize sealing locknuts or threaded hubs on sides and bottom of NEMA 3R and NEMA 12 enclosures.
    - d. Terminate conduits at threaded hubs at the tops of NEMA 3R and NEMA 12 boxes and enclosures.
    - e. Terminate conduits at threaded conduit hubs at NEMA 4 and NEMA 4X boxes and enclosures.
  - 2. Rigid Galvanized or Intermediate Conduit:
    - a. Provide one lock nut each on inside and outside of enclosure.
    - b. Install grounding bushing at source enclosure.
    - c. Provide bonding jumper from grounding bushing to equipment ground bus or ground pad.

- 3. Electric Metallic Tubing: Provide gland compression, insulated connectors.
- 4. Flexible Metal Conduit: Provide two screw type, insulated, malleable iron connectors.
- 5. Flexible, Nonmetallic Conduit: Provide nonmetallic, liquid-tight strain relief connectors.

## 3.11 OUTLET AND DEVICE BOXES

- A. General:
  - 1. Install plumb and level.
  - 2. Install suitable for conditions encountered at each outlet or device in wiring or raceway system, sized to meet NFPA 70 requirements.
  - 3. Open no more knockouts in sheet steel device boxes than are required; seal unused openings.
  - 4. Install galvanized mounting hardware in industrial areas.
- B. Size:
  - 1. Depth: Minimum 2 inches, unless otherwise required by structural conditions. Box extensions not permitted.
    - a. Hollow Masonry Construction: Install with sufficient depth such that conduit knockouts or hubs are in masonry void space.
  - 2. Ceiling Outlet: Minimum 4-inch octagonal device box, unless otherwise required for installed fixture.
  - 3. Switch and Receptacle: Minimum 2-inch by 4-inch device box.
- C. Locations:
  - 1. Drawing locations are approximate.
  - 2. Light Fixture: Install in symmetrical pattern according to room layout, unless otherwise shown.
- D. Mounting Height:
  - 1. General:
    - a. Dimensions given to centerline of box.
    - b. Where specified heights do not suit building construction or finish, adjust up or down to avoid interference.
    - c. Do not straddle CMU block or other construction joints.
  - 2. Light Switch:
    - a. 48 inches above floor.
    - b. When located next to door, install on lock side of door.
  - 3. Thermostat: 48 inches above floor.

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- 4. Data Outlet:
  - a. 18 inches above floor.
  - b. 6 inches above counter tops.
- 5. Convenience Receptacle:
  - a. General Interior Areas: 18 inches above floor.
  - b. General Interior Areas (Counter Tops): Install device plate bottom or side flush with top of backsplash, or 6 inches above counter tops without backsplash.
  - c. Industrial Areas: 48 inches above floor.
- 6. Switch, Motor Starting: 48 inches above floor, unless otherwise indicated on the Drawings.
- E. Flush Mounted:
  - 1. Install with concealed conduit.
  - 2. Install proper type extension rings or plaster covers to make edges of boxes flush with finished surface.
  - 3. Holes in surrounding surface shall be no larger than required to receive box.
- F. Supports:
  - 1. Support boxes independently of conduit by attachment to building structure or structural member.
  - 2. Install bar hangers in frame construction or fasten boxes directly as follows:
    - a. Wood: Wood screws.
    - b. Concrete or Brick: Bolts and expansion shields.
    - c. Hollow Masonry Units: Toggle bolts.
    - d. Steelwork: Machine screws.
  - 3. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.
  - 4. Provide plaster rings where necessary.
  - 5. Boxes embedded in concrete or masonry need not be additionally supported.
- G. Install separate junction boxes for flush or recessed lighting fixtures where required by fixture terminal temperature.
- H. Boxes Supporting Fixtures: Provide means of attachment with adequate strength to support fixture.

## 3.12 JUNCTION AND PULL BOXES

### A. General:

- 1. Install plumb and level.
- 2. Installed boxes shall be accessible.
- 3. Do not install on finished surfaces.
- 4. Use outlet boxes as junction and pull boxes wherever possible and allowed by applicable codes.
- 5. Use conduit bodies as junction and pull boxes where no splices are required and allowed by applicable codes.
- 6. Install pull boxes where necessary in raceway system to facilitate conductor installation.
- 7. Install where shown and where necessary to terminate, tap-off, or redirect multiple conduit runs.
- 8. Install in conduit runs at least every 150 feet or after the equivalent of three right-angle bends.
- B. Flush Mounted:
  - 1. Install with concealed conduit.
  - 2. Holes in surrounding surface shall be no larger than required to receive box.
  - 3. Make edges of boxes flush with final surface.
- C. Mounting Hardware:
  - 1. Noncorrosive Dry Areas: Galvanized.
  - 2. Noncorrosive Wet Areas: Stainless steel.
- D. Supports:
  - 1. Support boxes independently of conduit by attachment to building structure or structural member.
  - 2. Install bar hangers in frame construction or fasten boxes directly as follows:
    - a. Wood: Wood screws.
    - b. Concrete or Brick: Bolts and expansion shields.
    - c. Hollow Masonry Units: Toggle bolts.
    - d. Steelwork: Machine screws.
  - 3. Threaded studs driven in by powder charge and provided with lock washers and nuts are acceptable in lieu of expansion shields.
  - 4. Boxes embedded in concrete or masonry need not be additionally supported.

## 3.13 TELEPHONE AND DATA OUTLET

- A. Provide 4-11/16-inch square, deep outlet box.
- B. Provide single gang raised device cover for number of cables and outlets as shown on the Drawings.

### 3.14 EMPTY RACEWAYS

- A. Provide permanent, removable cap over each end.
- B. Provide PVC plug with pull tab for underground raceways with end bells.
- C. Provide nylon pull cord.
- D. Identify, as specified in Article Identification Devices, with waterproof tags attached to pull cord at each end, and at intermediate pull point.

### 3.15 PROTECTION OF INSTALLED WORK

- A. Protect products from effects of moisture, corrosion, and physical damage during construction.
- B. Provide and maintain manufactured watertight and dust-tight seals over conduit openings during construction.
- C. Touch up painted conduit threads after assembly to cover nicks or scars.

## **END OF SECTION**

### SECTION 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. ASTM International (ASTM):
    - a. D877/D877M, Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.
    - b. D923, Standard Practices for Sampling Electrical Insulating Liquids.
    - c. D924, Standard Test Method for Dissipation Factor (or Power Factor) and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids.
    - d. D971, Standard Test Method for Interfacial Tension of Oil Against Water by the Ring Method.
    - e. D974, Standard Test Method for Acid and Base Number by Color-Indicator Titration.
    - f. D1298, Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method.
    - g. D1500, Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale).
    - h. D1524, Standard Test Method for Visual Examination of Used Electrical Insulating Liquids in the Field.
    - i. D1533, Standard Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration.
    - j. D1816, Standard Test Method for Dielectric Breakdown Voltage of Insulating Liquids Using VDE Electrodes.
  - 2. Institute of Electrical and Electronics Engineers (IEEE):
    - a. 43, Recommended Practice for Testing Insulation Resistance of Electric Machinery.
    - b. 48, Standard Test Procedures and Requirements for Alternating-Current Cable Terminators Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV.
    - c. 81, Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
    - d. 95, Recommended Practice for Insulation Testing of AC Electric Machinery (2300V and Above) with High Direct Voltage.

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- e. 386, Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600V.
- f. 400, Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5 kV and Above.
- g. 450, Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications.
- h. C2, National Electrical Safety Code.
- i. C37.20.1, Standard for Metal-Enclosed Low-Voltage (1000 Vac and below, 3200 Vdc and below) Power Circuit Breaker Switchgear.
- j. C37.20.2, Standard for Metal-Clad Switchgear.
- k. C37.20.3, Standard for Metal-Enclosed Interrupter Switchgear.
- 1. C37.23, Standard for Metal-Enclosed Bus.
- m. C62.33, Standard Test Methods and Performance Values for Metal-Oxide Varistor Surge Protective Components.
- 3. Insulated Cable Engineers Association (ICEA):
  - a. S-93-639, 5-46 kV Shielded Power Cables for Use in the Transmission and Distribution of Electric Energy.
  - b. S-94-649, Concentric Neutral Cables Rated 5 through 46 kV.
  - c. S-97-682, Standard for Utility Shielded Power Cables Rated 5 through 46 kV.
- 4. National Electrical Manufacturers Association (NEMA):
  - a. AB 4, Guidelines for Inspection and Preventive Maintenance of Molded Case Circuit Breakers Used in Commercial and Industrial Applications.
  - b. PB 2, Deadfront Distribution Switchboards.
  - c. WC 74, 5-46 kV Shielded Power Cable for Use in the Transmission and Distribution of Electric Energy.
- 5. InterNational Electrical Testing Association (NETA): ATS, Acceptance Testing Specifications for Electrical Power Equipment and Systems.
- 6. National Fire Protection Association (NFPA):
  - a. 70, National Electrical Code (NEC).
  - b. 70B, Recommended Practice for Electrical Equipment Maintenance.
  - c. 70E, Standard for Electrical Safety in the Workplace.
  - d. 101, Life Safety Code.
- 7. National Institute for Certification in Engineering Technologies (NICET).
- 8. Occupational Safety and Health Administration (OSHA): CFR 29, Part 1910, Occupational Safety and Health Standards.

## 1.02 SUBMITTALS

- A. Informational Submittals:
  - 1. Submit 30 days prior to performing inspections or tests:
    - a. Schedule for performing inspection and tests.
    - b. List of references to be used for each test.
    - c. Sample copy of equipment and materials inspection form(s).
    - d. Sample copy of individual device test form.
    - e. Sample copy of individual system test form.
  - 2. Energization Plan: Prior to initial energization of electrical distribution equipment; include the following:
    - a. Owner's representative sign-off form for complete and accurate arc flash labeling and proper protective device settings for equipment to be energized.
    - b. Staged sequence of initial energization of electrical equipment.
    - c. Lock-Out-Tag-Out plan for each stage of the progressive energization.
    - d. Barricading, signage, and communication plan notifying personnel of newly energized equipment.
  - 3. Submit test or inspection reports and certificates for each electrical item tested within 30 days after completion of test:
  - 4. Operation and Maintenance Data: After test or inspection reports and certificates have been reviewed by Engineer and returned, insert a copy of each in Operation and Maintenance Manual.

## 1.03 QUALITY ASSURANCE

- A. Testing Firm Qualifications:
  - 1. Corporately and financially independent organization functioning as an unbiased testing authority.
  - 2. Professionally independent of manufacturers, suppliers, and installers of electrical equipment and systems being tested.
  - 3. Employer of engineers and technicians regularly engaged in testing and inspecting of electrical equipment, installations, and systems.
  - 4. Supervising engineer accredited as Certified Electrical Test Technologist by NICET or NETA and having a minimum of 5 years' testing experience on similar projects.
  - 5. Technicians certified by NICET or NETA.
  - 6. Assistants and apprentices assigned to Project at ratio not to exceed two certified to one noncertified assistant or apprentice.

- 7. Registered Professional Engineer to provide comprehensive Project report outlining services performed, results of such services, recommendations, actions taken, and opinions.
- 8. In compliance with OSHA CFR 29, Part 1910.7 criteria for accreditation of testing laboratories or a full member company of NETA
- B. Test equipment shall have an operating accuracy equal to or greater than requirements established by NETA ATS.
- C. Test Instrument Calibration: In accordance with NETA ATS.

## 1.04 SEQUENCING AND SCHEDULING

- A. Perform inspection and electrical tests after equipment listed herein has been installed.
- B. Perform tests with apparatus de-energized whenever feasible.
  - 1. Scheduled with Owner prior to de-energization.
  - 2. Minimized to avoid extended period of interruption to the operating plant equipment.
- C. Notify Owner at least 24 hours prior to performing tests on energized electrical equipment.

# PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

- 3.01 GENERAL
  - A. Tests and inspections shall establish:
    - 1. Electrical equipment is operational within industry and manufacturer's tolerances and standards.
    - 2. Installation operates properly.
    - 3. Equipment is suitable for energization.
    - 4. Installation conforms to requirements of Contract Documents and NFPA 70, NFPA 70E, NFPA 101, and IEEE C2.
  - B. Perform inspection and testing in accordance with NETA ATS, industry standards, and manufacturer's recommendations.
  - C. Adjust mechanisms and moving parts of equipment for free mechanical movement.

- D. Adjust and set electromechanical electronic relays and sensors to correspond to operating conditions, or as recommended by manufacturer.
- E. Verify nameplate data for conformance to Contract Documents and approved Submittals.
- F. Realign equipment not properly aligned and correct unlevelness.
- G. Properly anchor electrical equipment found to be inadequately anchored.
- H. Tighten accessible bolted connections, including wiring connections, with calibrated torque wrench/screw driver to manufacturer's recommendations, or as otherwise specified in NETA ATS.
- I. Clean contaminated surfaces with cleaning solvents as recommended by manufacturer.
- J. Provide proper lubrication of applicable moving parts.
- K. Inform Engineer of working clearances not in accordance with NFPA 70.
- L. Investigate and repair or replace:
  - 1. Electrical items that fail tests.
  - 2. Active components not operating in accordance with manufacturer's instructions.
  - 3. Damaged electrical equipment.
- M. Electrical Enclosures:
  - 1. Remove foreign material and moisture from enclosure interior.
  - 2. Vacuum and wipe clean enclosure interior.
  - 3. Remove corrosion found on metal surfaces.
  - 4. Repair or replace, as determined by Engineer, door and panel sections having dented surfaces.
  - 5. Repair or replace, as determined by Engineer, poor fitting doors and panel sections.
  - 6. Repair or replace improperly operating latching, locking, or interlocking devices.
  - 7. Replace missing or damaged hardware.
  - 8. Finish: Provide matching paint and touch up scratches and mars.
- N. Replace fuses and circuit breakers that do not conform to size and type required by the Contract Documents or approved Submittals.

## 3.02 CHECKOUT AND STARTUP

- A. Voltage Field Test:
  - 1. Check voltage at point of termination of power company supply system to Project when installation is essentially complete and is in operation.
  - 2. Check voltage amplitude and balance between phases for loaded and unloaded conditions.
  - 3. Unbalance Corrections:
    - a. Make written request to power company to correct condition if balance (as defined by NEMA) exceeds 1 percent, or if voltage varies throughout the day and from loaded to unloaded condition more than plus or minus 4 percent of nominal.
    - b. Obtain written certification from responsible power company official that voltage variations and unbalance are within their normal standards if corrections are not made.
- B. Equipment Line Current Tests:
  - 1. Check line current in each phase for each piece of equipment.
  - 2. Make line current check after power company has made final adjustments to supply voltage magnitude or balance.
  - 3. If phase current for a piece of equipment is above rated nameplate current, prepare Equipment Line Phase Current Report that identifies cause of problem and corrective action taken.

## 3.03 PANELBOARDS

- A. Visual and Mechanical Inspection:
  - 1. Include the following inspections and related Work:
    - a. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date Drawings and panelboard schedules.
    - b. Exercise and perform operational tests of mechanical components and other operable devices in accordance with manufacturer's instruction manual.
    - c. Check panelboard mounting, area clearances, and alignment and fit of components.
    - d. Check tightness of bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.
    - e. Perform visual and mechanical inspection for overcurrent protective devices.

- B. Electrical Tests:
  - 1. Include the following items performed in accordance with manufacturer's instruction:
    - a. Insulation Resistance Tests:
      - 1) Applied megohmmeter dc voltage in accordance with NETA ATS, Table 100.1.
      - 2) Each phase of each bus section.
      - 3) Phase-to-phase and phase-to-ground for 1 minute.
      - 4) <u>With</u> breakers open.
      - 5) With breakers closed.
      - 6) Control wiring except that connected to solid state components.
      - 7) Insulation resistance values equal to, or greater than, ohmic values established by manufacturer.
    - b. Ground continuity test ground bus to system ground.

### 3.04 LOW VOLTAGE CABLES, 600 VOLTS MAXIMUM

- A. Visual and Mechanical Inspection:
  - 1. Inspect each individual exposed power cable No. 6 and larger for:
    - a. Physical damage.
    - b. Proper connections in accordance with single-line diagram.
    - c. Cable bends not in conformance with manufacturer's minimum allowable bending radius where applicable.
    - d. Color coding conformance with Specification.
    - e. Proper circuit identification.
  - 2. Mechanical Connections for:
    - a. Proper lug type for conductor material.
    - b. Proper lug installation.
    - c. Bolt torque level in accordance with NETA ATS, Table 100.12, unless otherwise specified by manufacturer.
  - 3. Shielded Instrumentation Cables for:
    - a. Proper shield grounding.
    - b. Proper terminations.
    - c. Proper circuit identification.
  - 4. Control Cables for:
    - a. Proper termination.
    - b. Proper circuit identification.
  - 5. Cables Terminated Through Window Type CTs: Verify neutrals and grounds are terminated for correct operation of protective devices.

- B. Electrical Tests for Conductors No. 6 and Larger:
  - 1. Insulation Resistance Tests:
    - a. Utilize 1,000-volt dc megohmmeter for 600-volt insulated conductors.
    - b. Test each conductor with respect to ground and to adjacent conductors for 1 minute.
    - c. Evaluate ohmic values by comparison with conductors of same length and type.
    - d. Investigate values less than 50 megohms.
  - 2. Continuity test by ohmmeter method to ensure proper cable connections.
- C. Low-voltage cable tests may be performed by installer in lieu of independent testing firm.

### 3.05 SAFETY SWITCHES, 600 VOLTS MAXIMUM

- A. Visual and Mechanical Inspection:
  - 1. Proper blade pressure and alignment.
  - 2. Proper operation of switch operating handle.
  - 3. Adequate mechanical support for each fuse.
  - 4. Proper contact-to-contact tightness between fuse clip and fuse.
  - 5. Cable connection bolt torque level in accordance with NETA ATS, Table 100.12.
  - 6. Proper phase barrier material and installation.
  - 7. Verify fuse sizes and types correspond to one-line diagram or approved Submittals.
  - 8. Perform mechanical operational test and verify interlocking system operation and sequencing.
- B. Electrical Tests:
  - 1. Insulation Resistance Tests:
    - a. Applied megohmmeter dc voltage in accordance with NETA ATS, Table 100.1.
    - b. Phase-to-phase and phase-to-ground for 1 minute on each pole.
    - c. Insulation resistance values equal to, or greater than, ohmic values established by manufacturer.
  - 2. Contact Resistance Tests:
    - a. Contact resistance in microhms across each switch blade and fuse holder.
    - b. Investigate deviation of 50 percent or more from adjacent poles or similar switches.

## 3.06 MOLDED AND INSULATED CASE CIRCUIT BREAKERS

- A. General: Inspection and testing limited to circuit breakers rated 60 amperes and larger.
- B. Visual and Mechanical Inspection:
  - 1. Proper mounting.
  - 2. Proper conductor size.
  - 3. Feeder designation according to nameplate and one-line diagram.
  - 4. Cracked casings.
  - 5. Connection bolt torque level in accordance with NETA ATS, Table 100.12.
  - 6. Operate breaker to verify smooth operation.
  - 7. Compare frame size and trip setting with circuit breaker schedules or one-line diagram.
  - 8. Verify that terminals are suitable for 75 degrees C rated insulated conductors.
- C. Electrical Tests:
  - 1. Insulation Resistance Tests:
    - a. Utilize 1,000-volt dc megohmmeter for 480-volt and 600-volt circuit breakers.
    - b. Pole-to-pole and pole-to-ground with breaker contacts opened for 1 minute.
    - c. Pole-to-pole and pole-to-ground with breaker contacts closed for 1 minute.
    - d. Test values to comply with NETA ATS, Table 100.1.
  - 2. Contact Resistance Tests:
    - a. Contact resistance in microhms across each pole.
    - b. Investigate deviation of 50 percent or more from adjacent poles and similar breakers.

### 3.07 GROUNDING SYSTEMS

- A. Visual and Mechanical Inspection:
  - 1. Equipment and circuit grounds in panelboard assemblies for proper connection and tightness.
  - 2. Ground bus connections in panelboard assemblies for proper termination and tightness.
  - 3. Effective equipment grounding.

- 4. Accessible connections to grounding electrodes for proper fit and tightness.
- 5. Accessible exothermic-weld grounding connections to verify that molds were fully filled and proper bonding was obtained.

### 3.08 LOW-VOLTAGE MOTOR CONTROL

- A. Visual and Mechanical Inspection:
  - 1. Proper barrier and shutter installation and operation.
  - 2. Proper operation of indicating and monitoring devices.
  - 3. Proper overload protection for each motor.
  - 4. Improper blockage of air-cooling passages.
  - 5. Proper operation of drawout elements.
  - 6. Integrity and contamination of bus insulation system.
  - 7. Check door and device interlocking system by:
    - a. Closure attempt of device when door is in OFF or OPEN position.
    - b. Opening attempt of door when device is in ON or CLOSED position.
  - 8. Check nameplates for proper identification of: Equipment title and tag number with latest one-line diagram.
  - 9. Verify fuse and circuit breaker sizes and types conform to Contract Documents.
  - 10. Check operation and sequencing of electrical and mechanical interlock systems by:
    - a. Closure attempt for locked open devices.
    - b. Opening attempt for locked closed devices.
    - c. Key exchange to operate devices in OFF-NORMAL positions.
  - 11. Control Wiring:
    - a. Compare wiring to local and remote control, and protective devices with elementary diagrams.
    - b. Check for proper conductor lacing and bundling.
    - c. Check for proper conductor identification.
    - d. Check for proper conductor lugs and connections.
  - 12. Exercise active components.
  - 13. Inspect contactors for:
    - a. Correct mechanical operations.
    - b. Correct contact gap, wipe, alignment, and pressure.
    - c. Correct torque of connections.
  - 14. Compare overload heater rating with full-load current for proper size.
  - 15. Compare circuit breaker with motor characteristics for proper size.
  - 16. Perform phasing check on double-ended motor control centers to ensure proper bus phasing from each source.

# **END OF SECTION**

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## SECTION 26 24 16 PANELBOARDS

## PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. National Electrical Contractor's Association (NECA): 407, Recommended Practice for Installing and Maintaining Panelboards.
  - 2. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. 289, Application Guide for Ground Fault Circuit Interrupters.
    - c. KS 1, Enclosed Switches.
    - d. PB 1, Panelboards.
    - e. PB 1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
  - 3. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
  - 4. UL:
    - a. 67, Standard for Panelboards.
    - b. 98, Standard for Enclosed and Dead-Front Switches.
    - c. 486E, Standard for Equipment Wiring Terminals for use with Aluminum and/or Copper Conductors.
    - d. 489, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
    - e. 508, Standard for Industrial Control Equipment.
    - f. 870, Wireways, Auxiliary Gutters and Associated Fittings.
    - g. 943, Ground-Fault Circuit-Interrupters.
    - h. 1699, Standard for Arc-Fault Circuit-Interrupters.

## 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Manufacturer's data sheets for each type of panelboard, protective device, accessory item, and component.
  - 2. Manufacturer's Shop Drawings including dimensioned plan, section, and elevation for each panelboard type, enclosure, and general arrangement.
  - 3. Tabulation of features for each panelboard to include the following:
    - a. Protective devices with factory settings.
    - b. Provisions for future protective devices.
    - c. Space for future protective devices.

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- d. Voltage, frequency, and phase ratings.
- e. Enclosure type.
- f. Bus and terminal bar configurations and current ratings.
- g. Provisions for circuit terminations with wire range.
- h. Short circuit current rating of assembled panelboard at system voltage.

#### 1.03 QUALITY ASSURANCE

A. Listing and Labeling: Provide products specified in this section that are listed and labeled as defined in NEC Article 100.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Materials, equipment, and accessories specified in this section shall be products of:
  - 1. Eaton/Cutler-Hammer.
  - 2. General Electric Co.
  - 3. Square D Co.
  - 4. Siemens.

### 2.02 GENERAL

- A. Provide low voltage panelboards for application at 600V or less in accordance with this section.
- B. Provide equipment in accordance with NEMA PB 1, NFPA 70, and UL 67.
- C. Wire Terminations:
  - 1. Provide panelboard assemblies, including protective devices, suitable for use with 75 degrees C or greater wire insulation systems at NFPA 70, 75 degrees C conductor ampacity, and in accordance with UL 486E.
  - 2. Lugs for termination of conductors shall comply with Section 26 05 05, Conductors.
  - 3. Lugs for termination of copper feeder phase and neutral conductors shall be replaceable, bolted mechanical or crimp compression type.
- D. Load Current Ratings:
  - 1. Unless otherwise indicated, load current ratings for panelboard assemblies, including bus and circuit breakers, are noncontinuous as

defined by NEC. Continuous ratings shall be 80 percent of noncontinuous rating.

- 2. Where indicated "continuous" or "100 percent", selected components and protective devices shall be rated for continuous load current at value shown.
- 3. Short Circuit Current Rating (SCCR): Integrated equipment short circuit rating for each panelboard assembly shall be no less than the following: Minimum SCCR at 208Y/120 or 120/240 volts shall be 10,000 amperes rms symmetrical.
- E. Series-Connected Short Circuit Current Ratings: Panelboards shall be fully rated; application of series-connected device ratings is unacceptable.

## 2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Overcurrent Device Mounting and Arrangement: Design panelboards to accommodate device installation and replacement without disturbing adjacent devices and without removing main bus.
- B. Overcurrent Protective Devices: In accordance with NEMA KS 1, UL 98, and UL 489. Protective devices shall be adapted to panelboard installation.
- C. Provisions for Future Overcurrent Device:
  - 1. Provide space, mountings and bus connections such that like device may be installed without additional hardware.
  - 2. Panel openings shall be closed with individual removable cover for each provision for future device.
  - 3. Unless otherwise indicated, "spaces" in panelboards shall be fully equipped provision for future like devices.
  - 4. Provisions for future devices shall be suitable devices rated no less than 60 amperes.
- D. Branch Protective Devices:
  - 1. Provide Wire Lug Load Connections: Mechanical or crimp compression type, removable/replaceable, and suitable for 75 degrees C rated conductors without derating switch nor conductor ampacity.
  - 2. Provide a nameplate for each circuit, blanks for spares.

### 2.04 CIRCUIT BREAKERS

- A. General: Thermal-magnetic unless otherwise indicated, quick-make, quickbreak, molded case, of indicating type showing ON/OFF and TRIPPED positions of operating handle. Circuit breakers shall comply with Section 26 05 04, Basic Electrical Materials and Methods.
- B. Bus Connection: Bolt-on circuit breakers in 480Y/277-volt, and plug-in circuit breakers in 208Y/120 and 240/120-volt panelboards.
- C. Trip Mechanism:
  - 1. Individual permanent thermal and magnetic trip elements in each pole.
  - 2. Variable magnetic trip elements with a single continuous adjustment 3X to 10X for frames greater than 100 amps.
  - 3. Two and three pole, common trip.
  - 4. Automatically opens all poles when overcurrent occurs on one pole.
  - 5. Test button on cover.
  - 6. Calibrated for 40 degrees C ambient, unless shown otherwise.
- D. Unacceptable Substitution:
  - 1. Do not substitute single-pole circuit breakers with handle ties for multipole breakers.
  - 2. Do not use tandem or dual circuit breakers in normal single-pole spaces.
- E. Specialty Breakers:
  - 1. Where indicated, provide breakers with the following features:
    - a. Ground Fault Circuit Interrupter (GFCI): Rated to trip on 5-mA ground fault within 0.025 second (UL 943, Class A sensitivity, for protection of personnel). Ground fault sensor shall be rated same as circuit breaker. Breaker shall include push-to-test and reset buttons.

### 2.05 ENCLOSURES

- A. General:
  - 1. Provide as specified in Section26 05 04, Basic Electrical Materials and Methods.
  - 2. Type 1, Type 3R, and Type 3S material code-gauge, hot-dip galvanized sheet steel with reinforced steel frame.
  - 3. Provide surface-mount panelboard from trim with same dimensions as box front.

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- B. Finish: Rust inhibitor prime followed by manufacturer's standard gray baked enamel or lacquer.
- C. NEMA 250 Type 1 Branch Panelboard Enclosure:
  - 1. Secure front trim to box with concealed trim clamps.
  - 2. Overlap flush panelboards front trims with box nominal 3/4 inch on all sides.
  - 3. Provide door in panelboard front trim, with concealed hinges, to access protective device operating handles.
  - 4. Provide multi-point latching for doors over 30 inches in height.
  - 5. Door Lock: Secure with flush catch and tumbler lock; all panelboards keyed alike, with two milled keys each lock.
  - 6. Circuit Directory: Metal frame with transparent plastic face and enclosed card, mounted inside each panel door.
  - 7. Hinged Front Cover (Door In Door): Entire front trim hinged to surface box with standard door within hinged trim cover.

## 2.06 BUSSING AND TERMINAL BARS

- A. Bus:
  - 1. Material: Copper, full sized throughout length.
  - 2. Provide for mounting of future protective devices along full length of bus regardless of number of units and spaces shown. Machine, drill, and tap as required for current and future positions.
- B. Equipment Ground Terminal Bus: Copper with suitably sized provisions for termination of ground conductors and bonded to box.
  - 1. Provide individual mechanical termination points no less than the quantity of breaker pole positions.
  - 2. Provide individual termination points for all other grounding conductors such as feeder, grounding electrode, etc.
- C. Neutral Terminal Bus: Copper with suitably sized provisions for termination of neutral conductors, and isolated from box.
  - 1. Provide individual mechanical termination points no less than the quantity of breaker pole positions.
  - 2. Provide individual termination points for all other neutral conductors.
- D. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances for future protective device ampere ratings indicated.

### 2.07 SPECIAL FEATURES

A. General: Where indicated on the Drawings or schedules, provide special features as specified.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Install in accordance with NECA 407, NEMA PB 1.1, and manufacturers' written installation instructions.
- B. Install securely, plumb, in-line and square with walls.
- C. Install top of cabinet trim 78 inches above floor, unless otherwise shown. Install cabinet so tops of protective device operating handles are no more than 78 inches above the floor.
- D. Ground Fault Protection: Install panelboard ground fault circuit interrupter devices in accordance with installation guidelines of NEMA 289.
- E. Install filler plates in unused spaces.
- F. Wiring in Panel Gutters: Train conductors neatly in groups; bundle and wrap with nylon wire ties.
- G. Mount flush panels uniformly flush with wall finish.
- H. Provide typewritten circuit directory for each panelboard.

# **END OF SECTION**

### SECTION 26 24 19 LOW-VOLTAGE MOTOR CONTROL

### PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which shall be followed for this section:
  - 1. Institute of Electrical and Electronics Engineers (IEEE):
    - a. C2, National Electrical Safety Code (NESC).
    - b. C37.20.7, Guide for Testing Metal Enclosed Switchgear Rated up to 38 kV for Internal Arcing Faults.
  - 2. National Electrical Contractors Association (NECA): 402, Standard for Installing and Maintaining Motor Control Centers.
  - 3. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1,000 volts maximum).
    - b. ICS 1, Industrial Control and Systems: General Requirements.
    - c. ICS 2, Controllers, Contactors, and Overload Relays Rated 600 Volts.
    - d. ICS 2.3, Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers Rated Not More Than 600V.
    - e. ICS 18, Motor Control Centers.
    - f. KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
  - 4. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
  - 5. UL:
    - a. 98, Enclosed and Dead-Front Switches.
    - b. 489, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures.
    - c. 845, Motor Control Centers.

### 1.02 DEFINITIONS

- A. LCD: Liquid Crystal Display.
- B. N.C.: Normally Closed.
- C. N.O.: Normally Open.
- D. SPD: Surge Protection Device.

#### 1.03 SUBMITTALS

- A. Action Submittals:
  - 1. Descriptive information.
  - 2. Itemized Bill of Material.

#### 1.04 QUALITY ASSURANCE

A. Provide products manufactured within scope of UL that conform to UL Standards and have applied UL Listing Mark.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Provide materials, equipment, and accessories specified in this section manufactured by:
  - 1. Eaton Electrical/Cutler-Hammer.
  - 2. GE Industrial Systems.
  - 3. Schneider Electric/Square D Services.
  - 4. Allen-Bradley.
  - 5. Siemens.

#### 2.02 GENERAL

- A. Make adjustments necessary to wiring, conduit, disconnect devices, motor starters, branch circuit protection, and other affected material or equipment to accommodate motors actually provided under this Contract.
- B. Controllers: NEMA ICS 1, NEMA ICS 2, Class A.
- C. Control Transformer:
  - 1. Two winding, 120-volt secondary, primary voltage to suit.
  - 2. Two current-limiting fuses for primary circuit.
  - 3. One fuse in secondary circuit.
  - 4. Mount within starter unit.
- D. Suitable for use with 75 degrees C wire at full NFPA 70, 75 degrees C ampacity.
- E. Lifting lugs on equipment and devices weighing over 100 pounds.
- F. Enclosures: In accordance with NEMA 250.

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# 2.03 SEPARATELY MOUNTED MOTOR CONTROL

- A. Manually Operated Starter, Fractional Horsepower:
  - 1. Rating: 16 amperes continuous at 277 volts maximum.
  - 2. Single-phase, nonreversing, full voltage with overload protection.
  - 3. Toggle operated.
  - 4. Enclosure: shown.
  - 5. Neon Light: Red.
  - 6. Handle guard/lock-off attachment.
- B. Manually Operated Starter, Integral Horsepower:
  - 1. Rating: Horsepower rated to maximum of 10 horsepower at 600 volts with overload protection.
  - 2. Single-phase or three-phase, nonreversing, full voltage.
  - 3. Control: Toggle.
  - 4. Enclosure: As shown on the Drawings.
  - 5. Locking in OFF position.
  - 6. Two spare auxiliary, field-changeable contacts.
- C. Thermal Motor Overload Protection:
  - 1. Inverse-time-limit characteristic.
  - 2. Heater: Bimetallic overload, adjustable trip, or directly heated melting alloy, ratchet principle type element.
  - 3. Relay Trip: Standard, Class 20.
  - 4. Manual reset.
  - 5. Provide in each ungrounded phase.
  - 6. Mount within starter unit.

# PART 3 EXECUTION

# 3.01 INSTALLATION

- A. General:
  - 1. Install equipment in accordance with NEMA ICS 2.3, IEEE C2, NECA 402, Submittals, and manufacturer's written instructions and recommendations.
  - 2. Motor Data: Provide typed, self-adhesive label attached inside each motor starter enclosure door displaying the following information:
    - a. Motor served by tag number and equipment name.
    - b. Nameplate horsepower.
    - c. Motor code letter.
    - d. Full load amperes.

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- e. Service factor.
- f. Installed overload relay catalog number.
- B. Circuit Breakers:
  - 1. Field adjust trip settings of motor starter magnetic-trip-only circuit breakers.
  - 2. Adjust to approximately 11 times motor rated current.
  - 3. Determine motor rated current from motor nameplate following installation.
- C. Thermal Overload Relay:
  - 1. Select and install overload relays and apply settings after actual nameplate full-load current rating of motor has been determined.
  - 2. Initial Settings: In accordance with manufacturer's recommendation.

# **END OF SECTION**

# SECTION 26 27 26 WIRING DEVICES

## PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. ASTM International (ASTM): A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - 2. Federal Specifications (FS):
    - a. W-C-596G, General Specification for Connector, Electrical, Power.
    - b. W-S-896F, Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification).
  - 3. Institute of Electrical and Electronic Engineers, Inc. (IEEE):
    - a. C62.41.2, Recommended Practice on Characterization of Surges in Low-Voltage (1000V and less) AC Power Circuits.
    - b. C62.45, Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and less) AC Power Circuits.
  - 4. National Electrical Contractors Association (NECA): 1, Standard Practice of Good Workmanship in Electrical Contracting.
  - 5. National Electrical Manufacturers Association (NEMA):
    - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
    - b. FB 11, Plugs, Receptacles, and Connectors of the Pin and Sleeve Type for Hazardous Locations.
    - c. WD 1, General Color Requirements for Wiring Devices.
    - d. WD 6, Wiring Devices Dimensional Specifications.
  - 6. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC).
  - 7. UL:
    - a. 498, Standard for Safety for Attachment Plugs and Receptacles.
    - b. 508, Standard for Safety for Industrial Control Equipment.
    - c. 943, Standard for Safety for Ground-Fault Circuit-Interrupters.
    - d. 1010, Standard for Safety for Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations.
    - e. 1436, Standard for Safety for Outlet Circuit Testers and Similar Indicating Devices.
    - f. 1449, Standard for Safety for Surge Protective Devices (SPD).

## 1.02 SUBMITTALS

A. Action Submittals: Manufacturer's product data for wiring devices.

# PART 2 PRODUCTS

## 2.01 SWITCHES

- A. Switch, General Purpose:
  - 1. NEMA WD 1 and FS W-S-896F.
  - 2. Totally enclosed, ac type, with quiet tumbler switch and screw terminal.
  - 3. Rivetless one-piece brass or copper alloy contact arm with silver alloy contact.
  - 4. Capable of controlling 100 percent tungsten filament and fluorescent lamp loads.
  - 5. Rating: 20 amps, 120/277 volts.
  - 6. Automatic grounding clip and integral grounding terminal on mounting strap.
  - 7. Manufacturers and Products, Industrial Grade:
    - a. Cooper Arrow Hart; AH1220 Series.
    - b. Bryant; 4901 Series.
    - c. Hubbell; 1221 Series.
    - d. Leviton; 1221 Series.
- B. Switch, Motor Rated:
  - 1. Type: Two-pole or three-pole, manual motor starting/disconnect switch without overload protection.
  - 2. UL 508 listed.
  - 3. Totally enclosed snap-action switch. Quick-make, slow-break design with silver alloy contacts.
  - 4. Minimum General Purpose Rating: 30 amperes, 600V ac.
  - 5. Minimum Motor Ratings:
    - a. 2 horsepower for 120V ac, single-phase, two-pole.
    - b. 3 horsepower for 240V ac, single-phase, two-pole.
    - c. 15 horsepower for 480V ac, three-phase, three-pole.
  - 6. Screw-type terminal.
  - 7. Manufacturers and Products:
    - a. Cooper Arrow Hart.
    - b. Hubbell Bryant: HBL78 Series.
    - c. Leviton.

# 2.02 RECEPTACLES

- A. Receptacle, General Purpose:
  - 1. NEMA WD 1 and FS W-C-596G.
  - 2. Duplex, two-pole, three-wire grounding type with screw type wire terminals.
  - 3. Impact resistant nylon cover and body, with finder grooves in face, unless otherwise indicated.
  - 4. One-piece mounting strap with integral ground contact (rivetless construction).
  - 5. Contact Arrangement: Contact to be made on two sides of each inserted blade without detent.
  - 6. Rating: 125 volts, NEMA WD 1, Configuration 5-20R, 20 amps, unless otherwise indicated.
  - 7. Size: For 2-inch by 4-inch outlet box.
  - 8. Special Features: Provide the following features in comparable devices where indicated:
    - a. Listed weather-resistant per NEC 406.8 for installation in damp or wet locations.
  - 9. Industrial Grade Manufacturers and Products:
    - a. Cooper Arrow Hart; 5362 Series.
    - b. Hubbell Bryant; HBL 5362 Series.
    - c. Leviton; 5362 Series.
- B. Receptacle, Ground Fault Circuit Interrupter:
  - 1. Meet requirements of general-purpose receptacle.
  - 2. Listed Class A to UL 943, tripping at 5 mA.
  - 3. Rectangular smooth face with push-to-test and reset buttons.
  - 4. Listed weather-resistant per NEC 406.8 for installation in damp or wet locations.
  - 5. Feed-through Capability: 20 amps.
  - 6. Manufacturers and Products:
    - a. Hubbell Bryant; GFTR20 Series.
    - b. Cooper Arrow Hart WRVGF20 Series.
    - c. Leviton; 7899 Series.

## 2.03 TELEPHONE AND DATA JACK

- A. Compatible with Category 6 cable, and backwards compatible with Category 5 and Category 5e.
  - 1. High-impact thermoplastic body.
  - 2. Termination Type:
    - a. IDC with pair separation towers.
    - b. Compatible with 110-style termination tool.
  - 3. Snap-on cap to secure connections.
  - 4. Listed UL 1863.
  - 5. Manufacturers and Products:
    - a. Hubbell; HXJ6 Series.
    - b. Leviton; 61110 Series.

## 2.04 DEVICE PLATES

- A. Sectional type plate not permitted.
- B. Stainless Steel:
  - 1. Material: Specification grade, one-piece, 0.040-inch nominal thickness stainless steel.
  - 2. Finish: ASTM A167, Type 302/304, satin.
  - 3. Mounting Screw: Oval-head, finish matched to plate.

#### C. Cast Metal:

- 1. Material: Malleable ferrous metal, with gaskets.
- 2. Screw: Oval-head stainless steel.
- D. Sheet Steel:
  - 1. Finish: Zinc electroplate.
  - 2. Screws: Oval-head stainless steel.
  - 3. Manufacturers:
    - a. Appleton.
    - b. Crouse-Hinds.
- E. Weatherproof:
  - 1. Receptacle, Weatherproof Type 1:
    - a. Gasketed, cast-aluminum, with individual cap over each receptacle opening.
    - b. Mounting Screw and Cap Spring: Stainless steel.

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- c. Manufacturers and Products:
  - 1) Crouse-Hinds; Type WLRD-1.
  - 2) Appleton; Type FSK-WRD.
- 2. Receptacle, Weatherproof Type 2:
  - a. UL listed for wet location while in use.
  - b. Polycarbonate cover.
  - c. Manufacturer and Product: TayMac; Type Multi-Mac.
- 3. Switch:
  - a. Gasketed, cast-metal or cast-aluminum, incorporating external operator for internal switch.
  - b. Mounting Screw: Stainless steel.
  - c. Manufacturers and Products:
    - 1) Crouse-Hinds; DS-181 or DS-185.
    - 2) Appleton; FSK-1VTS or FSK-1VS.
- F. Raised Sheet Steel: 1/2-inch high zinc- or cadmium-plated steel designed for one-piece drawn type sheet steel box.

## 2.05 FINISHES

- A. Wiring device catalog numbers specified in this section do not designate device color. Unless otherwise indicated, or required by code, provide colors as specified below.
- B. Wiring Device: Other Areas: Gray.

# PART 3 EXECUTION

- 3.01 INSTALLATION, GENERAL
  - A. Comply with NECA 1.
  - B. Coordination with Other Trades:
    - 1. Ensure device and its box are protected. Do not place wall finish materials over device box and do not cut holes for box with router that is guided by riding against outside of box.
    - 2. Keep outlet box free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate raceway system, conductors, and cables.
    - 3. Install device box in brick or block wall such that cover plate does not cross a joint, unless otherwise indicated. Where indicated or directed to cross joint, trowel joint flush with face of wall.
    - 4. Install wiring device after 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 conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
- 3. Length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
- 4. Existing Conductors:
  - a. Cut back and pigtail or replace damaged conductors.
  - b. Straighten conductors that remain and remove corrosion and foreign matter.
  - c. Pigtailing existing conductors is permitted provided outlet box is large enough.
- D. Device Installation:
  - 1. Replace devices that have been in temporary use during construction or that show signs 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 last possible moment.
  - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches (150 mm) in length.
  - 5. Use torque screwdriver when a torque is recommended or required by manufacturer.
  - 6. When conductors larger than 12 AWG are installed on 15-amp or 20-amp circuits, splice 12 AWG pigtails for device connections.
  - 7. Tighten unused terminal screws on device.
  - 8. Device Plates:
    - a. Do not use oversized or extra deep plate.
    - b. Repair wall finishes and remount outlet box when standard device plate does not fit flush or does not cover rough wall opening.

#### 3.02 SWITCH INSTALLATION

- A. Switch, General Purpose:
  - 1. Mounting Height: See Section 26 05 33, Raceway and Boxes.
  - 2. Install with switch operation in vertical position.
  - 3. Install single-pole, two-way switch such that toggle is in up position when switch is on.

- B. Switch, Motor Rated:
  - 1. Mounting Height: See Section 26 05 33, Raceway and Boxes.
  - 2. Install with switch operation in vertical position such that toggle is in up position when ON.
  - 3. Install within sight of motor when used as disconnect switch.

## 3.03 RECEPTACLE INSTALLATION

- A. Duplex Receptacle:
  - 1. Install with grounding slot down, except where horizontal mounting is shown, in which case install with neutral slot updown.
  - 2. Ground receptacle to box with grounding wire.
  - 3. Weatherproof Receptacle:
    - a. Install in cast metal box.
    - b. Install such that hinge for protective cover is above receptacle opening.
  - 4. Ground Fault Interrupter: Install feed-through model at locations where ground fault protection is specified for "downstream" conventional receptacles.

#### 3.04 DEVICE PLATE INSTALLATION

- A. Securely fasten to wiring device; ensure tight fit to box.
- B. Flush Mounted: Install with all four edges in continuous contact with finished wall surface without use of mat or similar material. Plaster fillings will not be acceptable.
- C. Surface Mounted: Plate shall not extend beyond sides of box, unless plate has no sharp corners or edges.
- D. Install with alignment tolerance to box of 1/16-inch.
- E. Label with designated title to indicate device circuit number.
  - 1. Printed:
    - a. Character Height: 3/16-inch.
    - b. Text: Black.
    - c. Background: White.

- F. Type (Exterior):
  - 1. Switch: Weatherproof.
  - 2. Receptacle in Damp Location: Weatherproof Type 1.
  - 3. Receptacle in Wet Location: Weatherproof Type 2.
- G. Type (Interior):
  - 1. All Areas: Stainless steel.
  - 2. Flush Mounted Box: Stainless steel.
  - 3. Surface Mounted, Metal Box:
    - a. General Purpose Areas (Dry, Non-process): Sheet Steel.
    - b. Other Areas: Cast metal.
  - 4. Surface Mounted, Aluminum Box:
    - a. General Purpose Areas: Stamped.
    - b. Other Areas: Cast metal.
  - 5. Surface Mounted, Sheet Steel Box: Raised sheet steel.
  - 6. Surface Mounted, Cast Box: Cast.
  - 7. Surface Mounted, Nonmetallic Box: Manufacturer's standard.
  - 8. Receptacle Shown as Weatherproof on the Drawings: Weatherproof Type 1.

#### 3.05 IDENTIFICATION

- A. Use tape labels for identification of individual wall switches and receptacles in dry indoor locations.
  - 1. Degrease and clean device plate surface to receive tape labels.
  - 2. Use 3/16-inch Kroy black letters on white background, unless otherwise indicated.
  - 3. Identify panelboard and circuit number from which item is served on face of plate.
- B. Identify conductors with durable wire markers or tags inside outlet boxes.

#### 3.06 FIELD QUALITY CONTROL

- A. Perform tests and inspections, and prepare test reports.
- B. Test Instrument for 125-Volt 20-Amp Receptacle: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- C. Using test plug, verify device and its outlet box are securely mounted.
- D. Line Voltage Range: 105 volts to 132 volts.

- E. Percent Voltage Drop under 15-Amp Load: Less than 6 percent; 6 percent or higher is not acceptable.
- F. Ground Impedance: 2 ohms, maximum.
- G. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
- H. Tests shall be diagnostic, indicating damaged conductors, high resistance at circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

# **END OF SECTION**

# SECTION 26 50 00 LIGHTING

## PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. ASTM International (ASTM):
    - a. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
    - b. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
    - c. A572/A572A, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
    - d. A588/A588M, Standard Specification for High-Strength Low-Alloy Structural Steel, with 50 ksi [345 MPa] Minimum Yield Point to 4-in. [100-mm] Thick.
    - e. A595/A595M, Standard Specification for Steel Tubes, Low-Carbon or High-Strength Low-Alloy, Tapered for Structural Use.
    - f. A615/A615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
    - g. A1011/A1011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
    - h. D6576, Standard Specification for Flexible Cellular Rubber Chemically Blown.
    - i. G154, Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.
  - 2. American Wood Protection Association (AWPA): M6, Brands Used on Forest Products.
  - 3. Canadian Standards Association (CSA).
  - 4. Certified Ballast Manufacturer (CBM).
  - 5. Federal Communications Commission (FCC).
  - 6. Illuminating Engineering Society of North America (IESNA).
    - a. HB-9, Lighting Handbook.
    - b. LM-79, IES Electrical and Photometric Measurements of Solid-State Lighting Products.
    - c. LM-80, IESNA Approved Method for Measuring Lumen Maintenance of LED Light Sources.

- d. RP (Recommended Practices) Series.
- e. TM-21, Projecting Long Term Lumen Maintenance of LED Light Sources.
- Institute of Electrical and Electronics Engineers (IEEE): C62.41, Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- 8. National Electrical Manufacturers Association (NEMA):
- 9. 250, Enclosures for Electrical Equipment (1,000 Volts Maximum).
- 10. ICS 6, Industrial Control and Systems: Enclosures.
- 11. National Energy Policy Act.
- 12. National Fire Protection Association (NFPA): 70, National Electrical Code (NEC) Softbound Version.
- 13. Rural Utilities Service (RUS): 1728F-700, Specification for Wood Poles, Stubs and Anchor Logs.
- 14. UL:
  - a. 773, UL Standard for Safety Plug-In Locking Type Photocontrols for Use with Area Lighting Fourth Edition; Reprint with Revisions Through and Including March 08, 2002.
  - b. 844, Electric Lighting Fixtures for Use in Hazardous (Classified) Locations.
  - c. 924, Emergency Lighting and Power Equipment.
  - d. 1598, UL Standard for Safety Luminaires.
  - e. 2108, UL Standard for Safety Low Voltage Lighting Systems - First Edition; Reprint with Revisions through and Including February 24, 2014.
  - f. 8750, UL Standard for Safety Light Emitting Diode (LED) Equipment for Use in Lighting Products - First Edition; Reprint with Revisions Through and Including April 1, 2015.
- 15. U.S. Environmental Protection Agency and U.S. Department of Energy: Energy Star.

# 1.02 SUBMITTALS

- A. Action Submittals:
  - 1. Shop Drawings:
    - a. Interior Luminaires:
      - 1) Catalog data sheets with pictures.
      - 2) Luminaire material, finish, dimensions, and metal gauge.
      - 3) Lens material, pattern, and thickness.
    - b. LED Source Systems:
      - 1) General:
        - a) IESNA LM-80 test reports.
        - b) IESNA TM-21 ratings.

- c) Operating temperature range. Data sheet (chart/graph) describing life as a function of temperature.
- d) Warranty: Light engine and driver.
- e) Rated life.
- f) Surge protection.
- g) Thermal control device, heat sink.
- h) Enclosure and wiring information.
- i) Operating voltage range.
- 2) Electronic Module/Light Engine:
  - a) Correlated Color Temperature (CCT).
  - b) Color Rendering Index (CRI).
- 3) Drivers:
  - a) Input Current Total Harmonic Distortion.
  - b) Power factor.
  - c) Sound rating.

#### 1.03 QUALITY ASSURANCE

- A. Authority Having Jurisdiction (AHJ):
  - 1. Provide Work in accordance with NFPA 70, National Electrical Code (NEC). Where required by the AHJ, provide material and equipment labeled or listed by a nationally recognized testing laboratory or other organization acceptable to the AHJ to provide a basis for approval under NEC.
  - 2. Provide materials and equipment manufactured within the scope of standards published by UL in conformance with those standards and with an applied UL listing mark.
- B. Standard Products: Provide materials and equipment of manufacturers regularly engaged in the production of products specified in this section and that are of equal material, design, and workmanship.

#### PART 2 PRODUCTS

#### 2.01 LUMINAIRES

- A. Specific requirements relative to execution of the Work of this section are located in Luminaire Schedule on the Drawings.
- B. Provide luminaires and components tested, listed, and labeled by UL, or other approved testing agency.
- C. Provide luminaires with Illumination Engineering Society of North America (IESNA) formatted photometric files, ".ies" format, certified by the luminaire manufacturer for use with lighting software.

- D. Luminaire Labels:
  - 1. External label per ANSI C136.15.
  - 2. Internal label per ANSI C136.22.
- E. Provide luminaires rated by the manufacturer to start and operate to their full lumen capacity for rated life of the luminaire at the minimum low and maximum high ambient temperatures as defined in the Contract Documents at their installation location.
- F. Feed-through type, or separate junction box.
- G. Wire Leads: Minimum 18 AWG.
- H. Component Access: Accessible and replaceable without removing luminaire from ceiling.
- I. Soffit Installations (Interior or Exterior Damp Locations):
  - 1. UL Labeled: SUITABLE FOR DAMP LOCATIONS.
  - 2. Ballast: Removable, prewired.

# 2.02 LED SOURCE SYSTEMS

- A. General:
  - 1. Provide IESNA LM-80 test reports.
  - 2. Provide Energy Star compliance for solid state luminaires.
  - 3. Listed To: UL 8750 Standard for Safety for Light Emitting Diode (LED) Equipment for use in Lighting Products.
  - 4. Provide RoHS compliant LED light source(s) and driver(s).
  - 5. Warranty: 5 years minimum.
- B. Electronic Module/Light Engine:
  - 1. Mount all components to a single plate and factory prewired with quickdisconnect plugs.
  - 2. Include a driver, thermal control device, thermal protector device, and surge protector device. Provide surge protector tested in accordance with IEEE/ANSI C62.41.2 to Category C Low.
  - 3. Provide LEDs mounted to a metal-core circuit board and aluminum heat sink for optimal thermal management and long life.
  - 4. Correlated Color Temperature (CCT): As indicated on the Luminaire Schedule.
  - 5. Color Rendering Index (CRI): Minimum of 80.

- C. Drivers:
  - 1. Expected life of 100,000 hours at 25 degrees C.
  - 2. Provide drivers mounted in an all metal can.
  - 3. Operating Voltage Range: 50/60-Hz input source of 120V to 277V with sustained variations of plus or minus 10 percent voltage with no damage to the driver.
  - 4. Input Current Total Harmonic Distortion: Less than 20 percent up to 50 percent of full load rating.
  - 5. Power Factor: Greater than 0.90 for primary application up to 50 percent of full load rating.
  - 6. Sound rating: Class A.
  - 7. Comply with NEMA 410 for inrush current limits.

# PART 3 EXECUTION

## 3.01 LUMINAIRES

- A. General:
  - 1. Install in accordance with manufacturer's recommendations.
  - 2. Provide proper hangers, pendants, and canopies as necessary for complete installation.
  - 3. Provide additional ceiling bracing, hanger supports, and other structural reinforcements to building required to safely mount.
  - 4. Install plumb and level.
  - 5. Install each luminaire outlet box with galvanized stud.
- B. Mounting:
  - 1. General: Coordinate mounting, fastening, and environmental conditions with Section 26 05 02, Basic Electrical Requirements.
  - 2. Wall Mounted: Measure mounting heights from center of mounting plate to finished floor or finished grade, whichever is applicable.
- C. Finished Areas:
  - 1. Install symmetrically with tile pattern.
  - 2. Locate with centerlines either on centerline of tile or on joint between adjacent tile runs.
  - 3. Install recessed luminaires tight to finished surface such that no spill light will show between ceilings and sealing rings.
  - 4. Combustible Low Density Cellulose Fiberboard: Provide spacers and mount luminaires 1-1/2 inches from ceiling surface or use fixtures suitable for mounting on low density ceilings.

- 5. Junction Boxes:
  - a. Flush and Recessed Luminaires: Locate minimum 1-foot from luminaire.
  - b. In concealed locations, install junction boxes to be accessible by removing luminaire.
- 6. Wiring and Conduit:
  - a. Provide wiring of temperature rating required by luminaire.
  - b. Provide flexible steel conduit.
- 7. Provide plaster frames when required by ceiling construction.
- 8. Independent Supports:
  - a. Provide each recessed fluorescent luminaire with two safety chains or two No. 12 soft-annealed galvanized steel wires of length needed to secure luminaire to building structure independent of ceiling structure.
  - b. Select chain or wire with tensile strength and method of fastening to structure adequate to support luminaire weight.
  - c. Fasten chain or wire to each end of luminaire.
- D. Unfinished Areas: Locate luminaires to avoid conflict with other building systems or blockage of luminaire light output.

## 3.02 FIELD QUALITY CONTROL

- A. Upon completion of installation, verify equipment is properly installed, connected, and adjusted. Conduct an operating test to show equipment operates in accordance with the requirements of this section.
- 3.03 CLEANING
  - A. Remove labels and markings, except UL listing mark.
  - B. Wipe luminaires inside and out to remove construction dust.
  - C. Clean luminaire plastic lenses with antistatic cleaners only.
  - D. Touch up painted surfaces of luminaires with matching paint ordered from manufacturer.
  - E. Replace defective light fixtures at time of Substantial Completion.

# **END OF SECTION**

## SECTION 28 31 00 FIRE DETECTION AND ALARM

## PART 1 GENERAL

#### 1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. Institute of Electrical and Electronics Engineers (IEEE): C62.41, Surge Voltages in Low-Voltage AC Power Circuits.
  - 2. International Fire Code (IFC).
  - 3. International Building Code (IBC).
  - 4. National Fire Protection Association (NFPA):
    - a. 70, National Electrical Code (NEC).
    - b. 72, National Fire Alarm and Signaling Code.
    - c. 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.
    - d. 101, Code for Safety to Life from Fire in Buildings and Structures.
    - e. 820, Fire Protection in Wastewater Treatment and Collection Facilities.
    - f. 1221 Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems.
  - 5. National Electrical Manufacturers Association (NEMA): 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
  - 6. National Institute for Certification in Engineering Technologies (NICET).
  - 7. Telecommunications Industry Association (TIA):
    - a. 232, Interface Between Data Terminal Equipment and Data Circuit Terminating Equipment Employing Serial Binary Data Interchange.
    - b. 485, Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems.
  - 8. UL:
    - a. 217, Single and Multiple Station Smoke Alarms.
    - b. 228, Door Closures-Holders, With or Without Integral Smoke Detectors.
    - c. 268, Smoke Detectors for Fire Protective Signaling Systems.
    - d. 286A, Smoke Detectors for Duct Application.
    - e. 464, Audible Signal Appliances.
    - f. 497B, Protectors for Data Communication and Fire Alarm Circuits.
    - g. 864, Control Units for Fire-Protective Signaling Systems.

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## CCDC PARKING CAPITOL/MYRTLE GARAGE ELEVATOR #4 MODERNIZATION

- h. 1449, Standard for Transient Voltage Surge Suppressors.
- i. 1480, Speakers for Fire-Protective Signaling Systems.
- j. 1604, Electrical Equipment for Use in Class I and Class II, Division 2, and Class III Hazardous (Classified) Locations.
- k. 1638, Visual Signaling Appliances Private Mode Emergency and General Utility Signaling.
- 1. 1971, Signaling Devices for the Hearing Impaired.

#### 1.02 DEFINITIONS

- A. Addressable: A fire alarm system component with a unique identification that can have its status individually identified or that is used to individually control other functions.
- B. AHJ: Authority Having Jurisdiction.
- C. CAD: Computer-Aided Design.
- D. Coded: Audible or visible signal that conveys information about alarm event. Examples are, number of rings of a bell or flashes of a strobe. This could be used to convey location or type of alarm.
- E. dB: Decibels.
- F. DXF: Drawing Interchange Format.
- G. ECP: Environmental Control Panel.
- H. FACP: Fire Alarm Control Panel.
- I. HVAC: Heating, Ventilating, and Air Conditioning.
- J. I/O: Input/Output.
- K. IDC: Initiating Device Circuit.
- L. LCD: Liquid Crystal Display.
- M. LED: Light-Emitting Diode.
- N. MOV: Metal Oxide Varistor.
- O. NAC: Notification Appliance Circuit.
- P. RAM: Random Access Memory.
- Q. SLC: Signaling Line Circuit.

FIRE DETECTION AND ALARM 28 31 00 - 2

- R. SOM: Sequence of Operations Matrix.
- S. Zone: A defined area within the protected premises. A zone can define an area from which an alarm signal can be received or an area to which a signal can be sent. The term zone is typically used when describing conventional, nonaddressable systems.

## 1.03 SYSTEM DESCRIPTION

- A. Design Requirements:
  - 1. Contract Drawings show location of fire alarm system components.
  - 2. Design, coordinate, and provide system in accordance with building codes and requirements of local AHJ.
  - 3. Design conduit layout and wiring interconnection of devices specified herein.
  - 4. Coordinate design and installation with elevator installation.
  - 5. Provide equipment suitable for and compatible with existing addressable fire alarm system.
- B. Performance Requirements:
  - 1. Actuation of alarm (smoke or heat detector, flow switch, or other normally open initiating device contact) or trouble (trouble or supervisory switch) shall cause the following operations:
    - a. Audible and visual indications of alarmed devices on fire alarm control panel display, and on remote annunciator.
    - b. Closure of doors held open by electromagnetic devices.
    - c. Master fire alarm control panel shall transmit common alarm or trouble signal to central station.
  - 2. Actuation of smoke detectors in elevator pit, elevator shaft, elevator controller room, or elevator lobby shall send supervised signal to elevator controller for elevator fire hat and recall functions as shown on the Drawings.

#### 1.04 SUBMITTALS

- A. Action Submittals:
  - 1. Descriptive product information for each individual system component.
  - 2. Dimensional Drawings of panels and associated equipment.
  - 3. Itemized bill of material.
  - 4. Operating and programming instructions.
  - 5. Control panel configuration and module data.
  - 6. Complete point to point wiring diagrams of system and device interconnection. Identify spare connection points.

- 7. Alarm initiating, indicating, and supervisory device electrical data.
- 8. Annunciator configuration and module data.
- 9. Plans showing device and panel locations as well as conduit and cable sizes. Prepare Drawings and diagrams on the Drawing sheets of uniform size without extraneous information. Marked up electrical, HVAC, lighting or similar Drawings or copies of catalog data sheets are not acceptable in lieu of required Drawings or diagrams.
- 10. Sequence of Operation Matrix.
- 11. Battery sizing calculations.
- 12. Supervisory power requirements for equipment.
- 13. Alarm power requirements for equipment.
- 14. Power supply rating justification showing power requirements for system power supplies.
- 15. Voltage drop calculations for wiring runs, demonstrating worst case condition.
- 16. Conduit fill calculations.
- 17. Sample warranty.
- 18. Recommended types and quantities for spare parts.
- B. Informational Submittals:
  - 1. Experience and qualifications of firm(s) proposed to design and install system.
  - 2. Certifications documenting service technician's training. Certification shall indicate name of individual, training, dates, systems qualified, and current status.
  - 3. Copy of design documents, Shop Drawings, and calculations submitted to code-enforcement authorities.
  - 4. Code-enforcement authority approval letter.
  - 5. Factory test reports.
  - 6. Detailed program and schedule for testing, inspection, and maintenance of fire alarm system that satisfies requirements of NFPA 72, manufacturer's recommendations, and local authority having jurisdiction.
  - 7. Documentation of system voltage, current, and resistance readings taken during installation, testing, and ATP phases of system installation.
  - 8. System Record Drawings and wiring details including one set of reproducible masters and Drawings in electronic file in a DXF format suitable for use in a CAD drafting program.
  - 9. NFPA 72, Record of Completion: Submit to Owner and codeenforcement authorities.
  - 10. NFPA 72, Inspection and Testing Form: Submit to Owner and code enforcement authorities.
  - 11. Operation and Maintenance Data.

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# 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Provide names of Projects, locations, and telephone numbers of persons to contact for at least two installations where Contractor or Subcontractor has installed detection and alarm systems that are similar in size and scope to the Work.
  - Licensed Firm Responsible for System Design, Installation and Testing: Document established reputation in fire alarm system industry having 5 years' experience in design, installation, and testing of fire alarm systems.
  - 3. System Shop Drawings for code enforcement authority approval shall be prepared by a technician with minimum of NICET Level IV Certification for fire alarm systems.
  - 4. Technician with minimum of NICET Level III Certification for fire alarm systems shall provide general supervision of project execution and shall perform final testing and certification of the system.
  - 5. Technician with minimum of NICET Level II Certification for fire alarm systems shall directly supervise all onsite installation activities.
  - 6. Service technician shall be formally trained by manufacturer.
- B. Regulatory Requirements: Submit Shop Drawings and system design calculations for approval to the following code enforcement authorities.
  - 1. Local AHJ.

# PART 2 PRODUCTS

# 2.01 MANUFACTURERS

A. Materials, equipment, and accessories specified in this section shall be compatible with existing Silent Knight fire alarm control panel.

# 2.02 GENERAL

- A. Material and Equipment:
  - 1. Standard products of their respective manufacturers.
  - 2. Models produced for not less than 3 years.
  - 3. Equipment: Supported by a service organization that is, in the opinion of Owner, reasonably convenient to Site.
- B. Review details of Project prior to start of the Work, verify dimensions in field, and revise conduit and equipment locations to avoid obstructions and allow installation of new equipment.

C. Do not begin system installation prior to receiving written approval of Shop Drawings from Engineer.

#### 2.03 UL COMPLIANCE

- A. Products manufactured within scope of UL: Conform to UL Standards and have an applied UL listing mark.
- B. Provide equipment UL listed in accordance with requirements of NFPA.

#### 2.04 SERVICE CONDITIONS

- A. Altitude: Not greater than 3,300 feet above sea level.
- B. Ambient Temperature:
  - 1. Maximum 40 degrees C.
  - 2. Minimum 0 degrees C.
- C. Provide equipment fully rated without derating for these conditions.

#### 2.05 FIRE ALARM CONTROL PANELS

A. General: Retain and protect existing Silent Knight fire alarm control panel. Furnish and install all programming, modification, and expansion to existing fire alarm control panel to accommodate all new fire alarm devices and to provide a complete, operable fire alarm system.

#### 2.06 ADDRESSABLE DETECTOR BASE

- A. Solid state circuitry with integral LED visual alarm, dip switch or program selectable addressing, and common base receptacle for ionization, photoelectric, and heat detectors. Locate device address in base.
- B. Constantly monitors detector status and status changes.
- C. Suitable for mounting on standard outlet box.

#### 2.07 INDIVIDUAL ADDRESSABLE MODULE

- A. Solid state circuitry with selectable latch/non-latch operating conditions and mounting plate.
- B. Monitors single and multiple devices with dry contacts.
- C. Suitable for installing inside 4-inch by 4-inch by 2-1/2-inch electrical box.

FIRE DETECTION AND ALARM 28 31 00 - 6

# 2.08 INITIATING DEVICE

- A. Smoke Detector:
  - 1. Photoelectric type with plug-in, twist-lock addressable base in accordance with UL 268.
  - 2. Solid state circuitry, sensing chamber, suitable for device releasing service.
  - 3. Concealed, field adjustable, sensitivity test switch.
  - 4. LED; pulsed indication for power availability and steady indication for activated detectors.
  - 5. Self-Compensating Circuitry:
    - a. Voltage Range: 15V dc to 30V dc, 24V dc nominal.
    - b. Temperature Range: 0 degree C to 38 degrees C.
    - c. Operating Temperature Range: Minus 10 degrees C to 50 degrees C.
    - d. Humidity Range: 0 percent to 95 percent relative humidity.
  - 6. Detectors equipped with insect screen.
  - 7. Photoelectric sensors adjusted to within 3 percent of UL 217 window obturation sensitivity value.

## 2.09 NOTIFICATION APPLIANCES

- A. Audible Alarm:
  - 1. General:
    - a. Polarized, 24V dc device with sound power measured dB in accordance with UL 464.
    - b. Separate in/out wire leads for field connections.
    - c. Baked red enamel finish.
    - d. Audibility: In accordance with NFPA 72 and local requirements.
  - 2. Modular Horn:
    - a. Semiflush basic unit, complete with single projector, designed for mounting on 4-inch square standard electrical box.
    - b. Manufacturer supplied box with flush grille plate and basic surface unit for recessed horns.
- B. Visual Alarm, Fire:
  - 1. Polarized, 24V dc, multi-candela indicating output in accordance with UL 1638.
  - 2. Solid state circuitry for intensity control of xenon flashtube.
  - 3. Tamper-proof, translucent molded, polycarbonate, pyramidal shaped lens with "FIRE" in red lettering visible from 180-degree viewing field; red enclosure.
  - 4. Polarized in/out wiring.

- 5. Designed for mounting on wall or ceiling, single-gang electrical box, or as part of audible/visible base housing.
- 6. Synchronized unit.
- C. Combination Audible and Visual Alarm:
  - 1. Audible/visible base housing with visual alarm and front mounted horn as specified.
  - 2. Semi-flush mounting on recessed 4-gauge square electrical box or surface mounted on backbox with adapter.
  - 3. Audibility: In accordance with NFPA 72 and local requirements.
  - 4. Synchronous audible/visible output.

## 2.10 WIRING

- A. AC power wiring shall meet requirements of Section 26 05 05, Conductors.
- B. Low voltage wiring shall be solid copper or bunch tinned (bonded) stranded copper, minimum 14 AWG, and shall meet NEC Article 760 for nonpower limited service.
- C. Network or addressable loop cables shall be as recommended by manufacturer for installation of their system and UL Listed for Fire Alarm Systems.

#### 2.11 RACEWAYS

A. Conduit used for installation of Fire Alarm system shall follow requirements as identified in Section 26 05 33, Raceway and Boxes.

#### 2.12 END-OF-LINE RESISTORS

A. Ohmic value and power rating as determined by manufacturer based upon number of circuit devices supplied and circuit configuration as installed.

# PART 3 EXECUTION

#### 3.01 GENERAL

- A. Coordinate with other trades for mounting and interfacing with fire alarm system related devices.
- B. Install control panels, initiating and alarm devices, conduit, and wiring for interconnection of devices specified herein for complete and operable system.

## 3.02 INSTALLATION

- A. Install and connect fire detection and alarm equipment in accordance with manufacturer's instructions and recommendations, and in accordance with applicable codes and standards.
- B. Mount devices in accordance with manufacturer's instructions.
- C. Provide outlet and junction boxes that are compatible with raceway system.
- D. Mount detector LEDs so they are readily visible from floor.
- E. Program or configure panels and devices, as required to operate as defined by Sequence of Operations Matrix.
- F. Install conductors in accordance with Section 26 05 05, Conductors, and NFPA 70, Article 760.
- G. Install initiating alarm, signal, and communication conductors in separate and independent raceway system.
- H. Circuit wiring color-code, as established by installer, to be maintained throughout installation.
- I. Size conductors in accordance with device manufacturer's recommendations. Increase AWG size of alarm conductors, if necessary, to maintain terminal voltage drop within acceptable level required by NEC and NFPA.
- J. Do not install detectors until after construction cleanup is complete, in accordance with requirements of NFPA. If earlier installation is required by AHJ for protection during construction, clean or replace detectors installed prior to final clean-up.
- K. Duct Smoke Detector: Furnish, wire, and connect to fire alarm system in accordance with this Specification.
- L. HVAC Equipment: Wire and connect fire alarm system to air handling system, smoke exhaust fan and smoke damper control circuits, and fan status contacts.
- M. Suppression Sprinkler System: Wire and connect to fire alarm system to suppression sprinkler system.
- N. Wire and connect fire alarm system to elevator communications circuit and alarm. Coordinate work with elevator installer.

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#### 3.03 CONDUIT, ELECTRICAL ENCLOSURES, TERMINAL CABINETS, PULL BOXES, AND BACKPLATES

- A. Conduit Systems: Dedicated to fire alarm system and containing no unrelated conductors.
- B. Fire Alarm System Conduits: Size and type specified under Section 26 05 33, Raceway and Boxes.
  - 1. Conduit: As specified in Section 26 05 33, Raceway and Boxes.
    - a. Flexible Metallic Conduit: Allowable for whips to devices only.
      - 1) Maximum Length: 6 feet.
      - 2) Minimum Diameter: 3/4-inch.
      - 3) Set screw type couplings or connectors are specifically prohibited.
  - 2. Size conduits according to conductors contained therein.
  - 3. Maximum Cross Sectional Area Percentage Fill for Fire Alarm System Conduits: 40 percent.
- C. Route and install conduit to minimize potential for physical damage, either mechanical or by fire; avoid interference with existing building systems, facilities or equipment; and to facilitate service and minimize maintenance. Coordinate installation between different trades to avoid conflicts.
  - 1. Solidly attach conduit to building structural members or permanent walls, except flexible conduit whips to devices. Do not attach conduit to existing conduit, ductwork, cable trays, other ceiling equipment, drop ceiling hangers/grids or partition walls, except where necessary to connect to initiating, evacuation signaling, or auxiliary function devices.
  - 2. Route conduit either parallel or perpendicular to building structural members.
  - 3. Install conduit at a height to avoid obstructing any portion of a window, doorway cable tray, stairway, or passageway. Do not interfere with operation of existing mechanical or electrical equipment.
  - 4. Locate conduit, junction boxes, pull boxes, terminal cabinets, electrical enclosures, and device backboxes to be readily accessible for inspection, testing, service, and maintenance.
  - 5. Arrange conduit to minimize possibility of water in those conduits draining through control panels.
    - a. Arrange conduit, except nipples between control panels, to enter control cabinets from below.
    - b. Provide three 1/4-inch drain holes in conduit at horizontal low point beneath each control cabinet.
  - 6. Provide bushings at termination of conduit, prior to wire installation.

- 7. Install junction boxes as necessary. Pull conductors through junction boxes, without splices.
- 8. Install pullboxes in each conduit at intervals not to exceed 100 feet.
- 9. Minimum Pullbox Size: 4-inch square, minimum.
- 10. Size device backboxes and junction boxes to accommodate number of conductors contained. Extension rings or extension boxes are prohibited.
- 11. Provide junction boxes, pull boxes, terminal cabinets, device backboxes, and raceways gasketed and weather-tight in accordance with requirements of Section 26 05 33, Raceway and Boxes.
- D. Installation Requirements:
  - 1. Conduit, Junction Boxes, Panels, Electrical Enclosures, Relays and Device Backboxes in Unfinished Areas: Exposed.
  - 2. Conduit and Device Backboxes in Finished Areas: Concealed in walls, ceiling spaces, electrical shafts or closets, in finished areas, except as noted on the Drawings.
  - 3. Provide escutcheon plates on either side of the wall at exposed conduit wall penetrations.
- E. Seal penetrations of walls, floors, and ceilings around conduit(s), restoring walls, floors, and ceilings to their original condition, fire resistance, and integrity.
- F. Paint pull boxes, junction boxes, conduit bodies, and terminal cabinets "fire engine red" prior to installation. Provide touch-up painting, of normally visible pull boxes, junction boxes, and terminal cabinets prior to final acceptance testing.
- G. Ground conduit by approved ground clamps, and in accordance with NEC requirements.
- H. Mount end-of-line resistors on terminal blocks.
- I. Install detection and alarm wire in separate conduits. Route outgoing and return conductors for each supervised circuit separately as required by NFPA 72.
- J. Minimum Separation of Outgoing and Return Conduits: 1 foot vertically and 4 feet horizontally.

#### 3.04 IDENTIFICATION

A. Paint junction, terminal, and pulling box covers red and identify with engraved labels by loop number and circuit that it contains.

B. Provide engraved alphanumeric identification for detection and terminal devices keyed to posted operations and maintenance instructions.

#### 3.05 CONDUCTORS

- A. Requirements apply to fire alarm system conductors, including all signaling line, initiating device, indicating appliance, releasing function, remote signaling, ac and dc power and grounding/shield drain circuits.
- B. Conductors:
  - 1. New; do not use wire that has scrapes, nicks, gouges or crushed insulation.
  - 2. Install in conduit.
  - 3. Continuous between devices and between devices and intermediary terminal cabinets.
  - 4. Low voltage conductors shall be minimum size 14 AWG.
  - 5. In accordance with requirements of NEC, Article 760 for power limited service.
- C. Splices in conductors are specifically prohibited.
- D. Types:
  - 1. Conductors, Except AC Power Conductors and Grounding Conductors: Solid copper or bunch tinned (bonded) stranded copper.
  - 2. Stranded copper conductors are acceptable for ac power conductors and grounding conductors only.
- E. Terminations, including field connections to supervisory resistors, diodes, relays or other devices shall be to numbered terminals or terminal strips and readily accessible for inspection, service, testing and maintenance.
  - 1. Terminations shall be within junction boxes, device backboxes, terminal cabinets, control panels or other suitable metal enclosures.
  - 2. Terminals and terminal strips shall be suitable for the size and number of conductors connected to them.
  - 3. Uniquely number each conductor termination with durable plastic tags or uniquely identifiable by a combination of numbers and color codes. Show conductor numbers on Contractor's Record Drawings (floor plans and detailed wiring diagrams) in a manner allowing ready identification of conductor terminations.
  - 4. Wire nuts are prohibited.
  - 5. Where pigtail devices are factory provided with wires too short to be connected to terminal strips (such as, solenoids), provide soldered and taped connections.

FIRE DETECTION AND ALARM 28 31 00 - 12

- F. Control Panel Wiring:
  - 1. Fully dressed and bundled with nylon tie wraps at 3-inch intervals.
  - 2. Route bundled wiring parallel to terminal strips within control panels, with individual conductors turned out at 90 degree angles to their associated terminal connections.
  - 3. Bundle AC power conductors and route separately from low voltage conductors. Maintain a minimum 2-inch separation between AC power conductors and low voltage conductors wherever possible.
  - 4. Size control cabinets to accommodate the requirements of this section.
  - 5. Do not use control panels as raceways. Do not route conductors that do not terminate within a control panel through that control panel.
- G. Separate conductors into the following categories:
  - 1. Low voltage circuits that serve devices.
  - 2. AC power circuits.
- H. Install each category of conductors in physically separated, dedicated conduits, and isolate each category except at common associated control equipment. Further segregate conductors as necessary to conform to fire alarm system manufacturer's recommendations and as necessary to prevent electrical crosstalk between conductors installed in common conduits.
- I. Wiring: THHN or TFFN stranded. Use of multi-conductor twisted pair or similar wiring is not permitted.
- J. Install as power limited circuits in accordance with NFPA 72, and NEC, Article 760.
- K. Conductors looped around terminals are prohibited.
- L. Wire nut splices are prohibited.
- M. T-tapping of circuits is prohibited.
- N. Circuits shall be megger tested to voltage rating of their insulation before final terminations are made.

#### 3.06 REPAIR/RESTORATION

A. Touch up scratches, mars, and dents, incurred during shipment or installation of equipment.

- B. If required because of extensive damage, as determined by Engineer, refinish entire assembly.
- C. Keep covers on smoke detectors until areas have been thoroughly cleaned.

#### 3.07 TESTS AND INSPECTION

- A. In accordance with NFPA 72.
- B. Demonstrate entire system meets performance requirements specified in Article System Description.
- C. Perform tests in presence of code-enforcement authorities.
- D. Individually field test each smoke detector prior to installing device at its designated location to confirm operating condition after shipping and storage. Maintain a dated log indicating system address, type of device, sensitivity and initials of technician performing test, using test equipment specifically designed for that purpose, and submit as part of final acceptance documentation. After testing detection devices, base shall be labeled with system address, date, and initials of installing technician. Labeling shall not be visible after installation is complete.
- E. Test wiring runs for continuity, short circuits, and grounds before system is energized. Take resistance, current, and voltage readings as Work progresses and document results.
  - 1. Maintain a systematic record of all readings using schedules or charts of tests and measurements. Include readings, dates, and witnesses on the logging form.
  - 2. Notify Fire Marshal and Owner before start of any required tests. Correct items found at variance with Drawings or Specification during testing or inspection.
  - 3. Deliver test reports to Fire Marshal and Owner as completed.
- F. Prepare final as-built Sequence of Operations Matrix (See Supplement at End of Section) referencing each alarm input to every output function affected as a result of an alarm, trouble, or supervisory condition on that. For outputs programmed using more complex logic functions involving "any", "or", "not", "count", "time", and "timer" statements; reflect complete output equation in matrix.

- G. Prepare complete listing of device labels for alphanumeric annunciator displays and logging printers prior to acceptance test.
  - 1. Test system wiring to demonstrate correct system response and correct subsequent system operation in event of:
    - a. Open, shorted, and grounded intelligent analog signaling line circuit.
    - b. Open, shorted, and grounded network signaling line circuit.
    - c. Open, shorted, and grounded conventional initiating device circuits.
    - d. Primary power or battery disconnected.
  - 2. Demonstrate system evacuation alarm indicating appliances as follows:
    - a. Alarm notification appliances actuate as programmed.
    - b. Audibility and visibility at required levels.
  - 3. System indications shall be demonstrated as follows: Correct message display for each alarm input, at control panel, each remote alphanumeric LCD display.
  - 4. Demonstrate system onsite and offsite reporting functions as follows:
    - a. Correct alarm custom message display, address, device type, date and time transmitted, for each alarm input.
    - b. Correct trouble custom message display, address, device type, date and time transmitted, for each alarm input.
    - c. Trouble signals received for disconnect.
  - 5. Demonstrate secondary power capabilities as follows:
    - a. Disconnect system primary power for a period of time as specified herein; at end of period, confirm alarm condition shall be created and system performance as specified for required duration.
    - b. Restore system primary power for 48 hours and confirm that system-charging current is normal trickle charge for fully charged battery bank.
    - c. Check system battery voltages and charging currents at fire alarm control panel using test codes and LCD displays
- H. If system fails to perform as specified and programmed during acceptance test, test will be terminated at discretion of acceptance inspector.
  - 1. Retest system, correcting deficiencies and providing test documentation to acceptance inspector.
  - 2. If software changes are required during acceptance test, provide a utility program to compare edited program with original and furnish a printed list of changes and the system functions, inputs, and outputs affected by changes. Retest items listed as changed before resuming acceptance test. Submit printed list and log of successful retesting of changed elements before scheduling completion of acceptance test.

- 3. Acceptance inspector may elect to require complete acceptance test to be performed again if, in their opinion, modifications to system hardware or software warrant complete retesting.
- I. Upon completion of tests, complete and provide the following:
  - 1. NFPA 72, Record of Completion, and Inspection and Testing Form.
  - 2. Certification that final system meets UL.

# **END OF SECTION**

# PART 2

# DRAWINGS
# CCDC PARKING CAPITOL / MYRTLE GARAGE **ELEVATOR #4 MODERNIZATION** 445 S CAPITOL BLVD. GARAGE BOISE, IDAHO OCTOBER 2023

## **DRAWING INDEX**

SHEET	DRAWING NO.	DISCIPLINE	TITLE
1	G001	GENERAL	COVER SHEET, INDEX, AND GENERAL NOTES
2	A100	ARCHITECTURAL	LEVEL 1 OVERALL PLAN
3	A101	ARCHITECTURAL	LEVEL 1 CONTROLLER ROOM PLANS AND DETAIL
4	A102	ARCHITECTURAL	LEVEL 1 CONTROLLER ROOM SCHEDULES AND DETAILS
5	M101	MECHANICAL	LEVEL 1 CONTROLLER ROOM PLAN AND SCHEDULE
6	M501	MECHANICAL	LEVEL 1 CONTROLLER ROOM DETAILS
7	E001	ELECTRICAL	LEGEND AND GENERAL NOTES
8	E100	ELECTRICAL	LEVEL 1 OVERALL PLAN
9	E101	ELECTRICAL	LEVEL 1 ELECTRICAL AND CONTROLLER ROOM PLANS
10	E102	ELECTRICAL	LEVEL 1 ELECTRICAL AND CONTROL ROOM LIGHTING PLANS
11	E103	ELECTRICAL	FIRE ALARM PLANS



### VICINITY MAP



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SCALE

CODE: IBC 2018 LAND USE ZONE: C-5DDC









2

1

1

1

3	4	5

NAME	FLOOR	BASE	WALLS (NORTH)	WALLS (EAST)	WALLS (SOUTH)	WALLS (WEST)	CEILING	COMMENTS			
ELEVATOR LOBBY	EX	RB	P1/P2	EX	EX	P1/P2		MATCH EXISTING ACCENT PAINT HEIGHT			
ELEVATOR CONTROL	EX	RB	P1	P1	P1	P1	P1	FIRE TAPE AND CALK ALL SEAMS AND PENETRATIONS PER UL LISTINGS			
STAIR	EX	RB	EX	P1/P2	EX	EX		MATCH EXISTING ACCENT PAINT HEIGHT			

HEIGHT	WIDTH	FRAME TYPE	FRAME FINISH	PANEL TYPE	PANEL FINISH	FIRE RATING	HARDWARE SET
7'-0"	3'-0"	А	P4	HM	P3	1.5 HOURS	HDW-6

## FRAME TYPE



### FRAME TYPE A

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6



DX	SPLIT SYSTEM SCHE	DULE		
DES	IGNATION	AC-1/ODU-1		
COOLING CAPACITY BTUH (TOTAL)18,000COOLING CAPACITY BTUH (SENSIBLE)13,140				
COOLING CAPACITY BTUH (SENSIBLE)13,140SEER20.2				
SEE	R	20.2		
VOL	TS / PH	208/1		
REF	RIGERANT	R-410A		
	DESIGNATION	AC-1		
	VOLUME CFM	265-310-385-455		
E	HEIGHT IN	12		
N N	WIDTH IN	36		
L L L	DEPTH IN	11		
NDOO	WEIGHT LBS	28		
	MCA	1		
=	CONFIGURATION	WALL		
	SERVICE LOCATION	ELECTRCIAL		
	MODEL	TPKA0A0181LA10A		
	DESIGNATION	ODU-1		
	AMBIENT TEMP MAX	95 F		
E	AMBIENT TEMP MIN	20 F		
Ī	HEIGHT IN	24		
R	WIDTH IN	34		
8	DEPTH IN	16		
ĕ	WEIGHT LBS	92		
5	MCA	11		
0	MOCP	28		
	MODEL	TRUYA0181KA70NA		
	MANUFACTURER	MITSUBISHI		
NOT	EQ.			

INUTES.

. PROVIDE HARDWIRED ELECTRONIC PROGRAMMABLE THERMOSTAT AND CONTROL WIRING.

2. FURNISH WITH FACTORY CONDENSATE PUMP.

3. PROVIDE WITH FACTORY FURNISHED WALL BRACKET FOR OUTDOOR UNIT. CONTROL ROOM.

4. CONTRACTOR SHALL COORDINATE REFRIGERANT PIPE SIZING PER MANUFACTURERS RECCOMENDATIONS.



Energy Code:
Project Title:
Location:
Climate Zone
Project Type:

Construction Site: 455 S. Capital Blvd

### Mechanical Compliance Statement

Ted Price, PE	
Name - Title	Sig

1 2 FOR RATED PENETRATION ASSEMBLY DETAIL TO BE USED AT NEW CONTROL ROOM LID, SEE PROVIDE WALL SLEEVES FOR PIPING. INTERIOR WALL, SEE FLOOR PLAN -- EXTERIOR WALL, SEE FLOOR PLAN Š INDOOR UNIT (AC-1) OVERHEAD, SEE SCHEDULE -VI AIRFLOW SA PROVIDE FOR WIRED -THERMOSTAT POWER AND CONTROL WIRING TO INDOOR UNIT -----INSULATED REFRIGERANT LINES. SECURE TO WALL PER MANUFACTURER'S REQUIREMENTS. -----SEQUENCE OF OPERATION SETPOINT TEMPERATURE: COOLING: CONTINUOUS 85° F (ADJUSTABLE) RUN MODE: 1. EVAPORATOR FAN SHALL RUN CONTINUOUSLY. 2. UNITS SHALL CYCLE COOLING SECTION OFF/ON AS REQUIRED TO MAINTAIN ROOM SETPOINT. SPLIT SYSTEM AIR CONDITIONING UNIT DETAIL  $\begin{pmatrix} 1 \end{pmatrix}$ 



— OUTDOOR UNIT (ODU-1),

MOUNTED ON WALL. SEE SCHEDULE.



NOTE: ENTIRE PENETRATION ASSEMBLY SHALL BE CONSTRUCTED IN ACCORDANCE WITH UL LISTED RATED ASSEMBLY DETAIL.



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Filename M501.dwg

	ELECTRICAL LEGEND AND ABBREVIATIONS		CUIT SCH	HE
۲	CONNECTION POINT TO EQUIPMENT SPECIFIED, FURNISHED, AND INSTALLED UNDER OTHER SECTIONS, UNLESS OTHERWISE NOTED, RACEWAY, CONDUCTOR AND CONNECTION IN THIS SECTION.	[a] - E. [b] - 1' [c] - 1"	XISTING 1"C, 3#8 'C, 3#8, 1#10G 'C, 3#6, 1#10G	s, 1#1
	- EXPOSED CONDUIT AND CONDUCTORS (3/4"C, 2#10, 1#10G, UON)	[0] - 1	0, 5#0, 1#100	
	- CONCEALED CONDUIT AND CONDUCTORS (3/4"C, 2#10, 1#10G, UON)			
NA7	CONDUIT HOME RUN - DESTINATION SHOWN			
(20F)30	DISCONNECT SWITCH, SIZE INDICATED, FUSED 3-POLE, UNLESS INDICATED OTHERWISE. SIZE FUSE AS NOTED IN PARENTHESIS. (NF INDICATES NON-FUSED).			
200A CB	BREAKER, SEPARATELY MOUNTED, SIZE INDICATED, 3 POLE, NEMA 4 ENCLOSURE.			
⊖ GFI	DUPLEX CONVENIENCE RECEPTACLE - SUBSCRIPT ID. GFI - GROUND FAULT CIRCUIT INTERRUPTER			
$\bigcirc$	FAS PHOTOELECTRIC SMOKE DETECTOR			
	FAS ADDRESSABLE CONTROL/RELAY MODULE (X) INDICATES QUANTITY			
	FAS ADDRESSABLE INPUT MONITOR MODULE			
<b>S1</b>	CEILING MOUNTED LIGHTING FIXTURES (SEE LUMINAIRE SCHEDULE FOR TYPE)	PANEL:	LG2	
₩1 	WALL MOUNTED LIGHTING FIXTURES	VOLTAC ENTRY:	<b>GE:</b> 120/208	B PF MC
	(SEE LUMINAIRE SCHEDULE FOR TYPE)	LOADS	PHASE A: PHASE B:	18 1:
2	TELEPHONE/DATA OUTLET: (# INDICATES NUMBER OF CATEGORY 6 CABLES)		TOTAL:	32
S	WALL SWITCH (+48" AFF TO CENTER UON)	(VA)		
	MONE - SINGLE POLE M - MOTOR RATED	180	RCPT: ELEV	ATC
	2 - DOUBLE POLE 3 - 3 WAY	500	MISC: ELEV	ATC
	P - PILOT LIT (WHEN LOAD IS ON)		BLANK	
A	AMP		BLANK BLANK	
AIC	AMPERE INTERRUPTING CAPACITY		BLANK	
AUX	AUXILIARY		BLANK BLANK	
С	CONDUIT			
FAS	FIRE ALARM SYSTEM			<u>  L</u>
FACP	FIRE ALARM CONTROL PANEL	DEMAN	D FACTOR	
G	GROUND		DVA	*
Р	POLE	*EQUAL	<u>G FOR O.C.P.</u> S DEMAND VA	A AT
UON	UNLESS OTHERWISE NOTED			
		LABEL	DESCRIPTI	ON
		S1	4' STRIPLIG	HT
		W1	4' VAPORTITE ST	RIPLIC
		LUMINAIRE SC	HEDULE NOTES: ENERAL NOTE: DESIGN	IS BAS











### PARTIAL ELECTRICAL ONE LINE DIAGRAM 1

PANELBOARD SCHEDULE													
)		PROJECT:	CCD	C CA	PIT	OL &	MYRTLE	E PAR	KINC	G G	ARAG	E	
120/208 PHASE: 1 WIRE: 3 AMPERE RA					E RA	TING:	60						
MOUNTING: SURFACE PRIMA						IMAR	Y MAIN	60A C	В			SHORT CIRCUIT RATING: 10k AIC FULLY RATED	
ASE A:	1866	LOAD TYPES:	1 = L	IGHT	ING	;	TOTAL	CAL	CULA	TE	D 0.C	<b>.P. AMPS:</b> 19.4	
ASE B:	1365		2 = R	ECE	ΡΤΑ	CLE	REMAF	RKS:					
			3 = N	IISC									
AL:	3231		4 = N	ΙΟΤΟ	R								
			LOAD	AMF	PS/	CKT		CKT	AMF	PS/	LOAD		LOAD
	LOAD	) SERVED	TYPE	POL	ES	NO	PHASE	NO	POL	ES	TYPE	LOAD SERVED	(VA)
PT: ELEV	ATOR PI	Г	2	20	1	1	A	2	15	2	3	ODU-1	1144
PT: ELEV	ATOR CC	NTROLLER ROOM	2	20	1	3	В	4			3		1144
C: ELEVA	ATOR CO	NTROLS	3	20	1	5	A	6	20	1	1	LIGHT: ELEVATOR PIT	42
RE				20	1	7	В	8	20	1	1	LIGHT: ELEVATOR CONTROLLER ROOM	41
NK					1	9	A	10		1		BLANK	
NK					1	11	В	12		1		BLANK	
NK					1	13	A	14		1		BLANK	
NK					1	15	В	16		1		BLANK	
NK					1	17	A	18		1		BLANK	
NK 1 19					В	20		1		BLANK			
						MOT		TOTA					

LIGHTING	RECPT	MISC.	MOTOR	TOTAL LOAD
83	360	2,788	0	3,231
1.00	SEE NOTE 1	1.00	SEE NOTE 2	
83	360	2,788	0	3,231
104	450	3,485	0	4,039

<u>NOTES</u>

1. DEMAND FACTOR: 1ST 10kVA AT 100%; OVER 10KVA AT 50%.

2. LARGEST MOTOR LOAD AT 125%; ALL OTHERS AT 100%.

MAND VA AT 125% (FOR MOTOR LOADS, SEE NOTE 2)

CAPITOL & MYRTLE PARKING GARAGE ELEVATOR MODERNIZATION LIGHTING FIXTURE SCHEDULE											
	LAMP TYPE	LUMENS	FIXTURE WATTS	VOLTAGE	MANUFACTURER	CATALOG NUMBER	MOUNTING	COMMENTS / N			
	LED, 4000K	5541	41	120	LITHONIA (ALT: METALUX, DAYBRITE, ORACLE)	ZL1D L48 5000LM FST MVOLT 40K 80CRI WH E7W	SURFACE, CEILING	WITH BATTER			
GHT	LED, 4000K	5168	42	120	COLUMBIA (LDPI, LITHONIA, DAYBRITE, ORACLE)	LXEM 4 40 ML RFA E U	SURFACE, WALL	SEALED AND G			
				• • • • •	/						

NOTES: NOTE: DESIGN IS BASED ON FIRST NAMED MANUFACTURER. THE ALTERNATE MANUFACTURERS ARE ACCEPTABLE, SUBJECT TO COMPLIANCE WITH THE SPECIFIED REQUIREMENTS, MODEL NUMBER, TYPE, AND / OR CATALOG NUMBER. NOTE: CONTRACTOR SHALL PROVIDE REQUIRED FIXTURE QUANTITIES, INSTALLATION FEATURES, AND COORDINATE ALL FIXTURE MOUNTING ACCESSORIES. NOTE: REFER TO ARCHITECTURAL REFLECTED CEILING PLANS, ELEVATIONS, AND DETAILS FOR SPECIFIC MOUNTING LOCATIONS, HEIGHTS, AND OTHER REQUIREMENTS.















# SHEET KEYNOTES

- 1. REMOVE EXISTING LIGHTING FIXTURE IN ELEVATOR PIT. FURNISH AND INSTALL NEW LIGHT FIXTURE AND CONTROLS AS SHOWN.
- 2. RELOCATE EXISTING LIGHT FIXTURE IN ELEVATOR LOBBY TO ACCOMMODATE NEW CONTROLLER ROOM; EXTEND AND RECONNECT EXISTING CIRCUIT.
- 3. CONNECT LIGHTING IN ELEVATOR CONTROLLER ROOM TO DEDICATED 120 VOLT CIRCUIT, PER NEC 620.23.



**Project Information** Energy Code: Project Title: Project Type:

Statement



## SHEET KEYNOTES

1. REMOVE EXISTING HEAT DETECTOR IN ELE RETAIN AND PROTECT EXISTING SMOKE DE

5

- 2. REMOVE EXISTING HEAT DETECTOR IN ELE LOBBY. RELOCATE EXISTING SMOKE DETEC LOBBY AS SHOWN.
- 3. REMOVE EXISTING FIRE ALARM CONTROL FOR ELEVATOR SHUNT TRIP. RELOCATE EX CONTROL MODULES FOR ELEVATOR PRIMA SECONDARY RECALL, AND FIRE HAT FUNCT DOWN INTO CONTROLLER ROOM. RELOCAT ALARM MONITOR MODULE FOR ELEVATOR I DOWN INTO CONTROLLER ROOM. PROVIDE ALARM SYSTEM CONNECTIONS TO ELEVAT CONTROLLER; COORDINATE WITH ELEVATO INSTALLER.
- 4. RETAIN AND PROTECT EXISTING SMOKE DE ELEVATOR LOBBY.
- 5. PROGRAM SMOKE DETECTOR FOR ELEVATO PER ASME A17.1 PRIMARY ELEVATOR RECA BE TO LEVEL 1, SECONDARY ELEVATOR RE SHALL BE TO LEVEL 2.



2 FIRE ALARM PLAN - LEVEL 2

4

3



	GENERAL NOTES				ERVED
EVATOR PIT. ETECTOR. EVATOR CTOR IN MODULE XISTING ARY RECALL, TIONS TE FIRE POWER E FIRE FOR OR ETECTOR IN FOR RECALL ALL SHALL ECALL	<ol> <li>FURNISH, INSTALL, AND CONNECT THE REQUIRED QUANTITY OF CONDUCTORS IN CONDUIT FOR THE LIGHTING, POWER, FIRE ALARM, AND TELECOMMUNICATIONS CIRCUITS SHOWN.</li> <li>COORDINATE PENETRATIONS OF WALLS, CEILINGS, OR STRUCTURE WITH THE OWNER. FURNISH AND INSTALL FIRE STOP MATERIALS TO MAINTAIN FIRE RATING.</li> <li>FOR ADDITIONAL ELECTRICAL INSTALLATION CONDITIONS AND REQUIREMENTS, SEE SPECIFICATIONS DIVISIONS 26, 27, AND 28.</li> <li>CONNECT ALL NEW FIRE ALARM DEVICES INTO EXISTING FIRE ALARM SYSTEM. ALL FIRE ALARM CABLES AND CONDUCTORS SHALL BE ROUTED IN CONDUIT (<sup>3</sup>/<sub>4</sub>" MINIMUM). FURNISH AND INSTALL ALL PROGRAMMING, MODIFICATION, AND EXPANSION TO EXISTING FIRE ALARM CONTROL PANEL TO ACCOMMODATE ALL NEW FIRE ALARM DEVICES AND TO PROVIDE A COMPLETE, OPERABLE FIRE ALARM SYSTEM.</li> </ol>	www.Jacobs.com			
			NO. DATE REVISION BY APUD	DSGN DR CHK APVD J HATTEN T KENDALL T HASH J HATTEN	
Filename	E103.dwg	Project Title: CCDC PARKING GARAGE Date: brownic in the mode of	Drawing Title: ELECTRICAL FIRE ALARM D362 E103	R 2023	PERMIT DRAWINGS

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