

# PROJECT MANUAL CONTRACTUAL-LEGAL REQUIREMENTS SPECIFICATIONS

**CESAR CHAVEZ ELEMENTARY SCHOOL  
3 NEW RELOCATABLE CLASSROOMS  
BAKERSFIELD CITY SCHOOL DISTRICT  
DSA APP #: 03-126270**



Project No. 5682.3

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IDENTIFICATION STAMP  
DIV. OF THE STATE ARCHITECT

APP: 03-126270 INC:

REVIEWED FOR

SS ☒ FLS ☒ ACS ☒

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5682.3 CESAR CHAVEZ ELEMENTARY  
3 NEW RELOCATABLE CLASSROOMS  
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## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

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

#### 1.3 DEFINITIONS

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

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 65 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials., including the following:
  - 1. Demolition Waste:
    - a. Concrete.
    - b. Wood studs.
    - c. Wood joists.
    - d. Plywood.
    - e. Insulation.

- f. Doors and frames.
- g. Door hardware.
- h. Gypsum board.
- i. Acoustical tile and panels.

2. Construction Waste:

- a. Lumber.
- b. Wood sheet materials.
- c. Wood trim.
- d. Metals.
- e. Gypsum board.
- f. Piping.
- g. Electrical conduit.
- h. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
  - 1) Paper.
  - 2) Cardboard.
  - 3) Boxes.
  - 4) Plastic sheet and film.
  - 5) Polystyrene packaging.
  - 6) Wood crates.
  - 7) Plastic pails.

1.5 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.

1.6 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-7 for construction waste and Form CWM-8 for demolition waste Include the following information:
  - 1. Material category.
  - 2. Generation point of waste.
  - 3. Total quantity of waste in tons.
  - 4. Quantity of waste salvaged, both estimated and actual in tons.
  - 5. Quantity of waste recycled, both estimated and actual in tons.
  - 6. Total quantity of waste recovered (salvaged plus recycled) in tons.
  - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator.

#### 1.7 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
  - 1. Review and discuss waste management and waste management coordination.
  - 2. Review requirements for documenting quantities of each type of waste and its disposition.
  - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  - 5. Review waste management requirements for each trade.

#### 1.8 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Use Form CWM-1 for construction waste and Form CWM-2 for demolition waste. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-3 for construction waste and Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Use Form CWM-5 for construction waste and Form CWM-6 for demolition waste. Include the following:
1. Total quantity of waste.
  2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
  3. Total cost of disposal (with no waste management).
  4. Revenue from salvaged materials.
  5. Revenue from recycled materials.
  6. Savings in hauling and tipping fees by donating materials.
  7. Savings in hauling and tipping fees that are avoided.
  8. Handling and transportation costs. Include cost of collection containers for each type of waste.
  9. Net additional cost or net savings from waste management plan.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
1. Distribute waste management plan to everyone concerned within three days of submittal return.
  2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  - 3. Store items in a secure area until installation.
  - 4. Protect items from damage during transport and storage.
  - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area designated by Owner.
  - 5. Protect items from damage during transport and storage.
- D. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- E. Plumbing Fixtures: Separate by type and size.
- F. Lighting Fixtures: Separate lamps by type and protect from breakage.
- G. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

### 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

### 3.4 RECYCLING DEMOLITION WASTE

- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  1. Pulverize concrete to maximum 4-inch size.
  2. Crush concrete and screen to comply with requirements in Section 312000 "Earthwork-Excavation, Filling and Grading" for use as satisfactory soil for fill or subbase.
- B. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- C. Metals: Separate metals by type.
  1. Structural Steel: Stack members according to size, type of member, and length.
  2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
  3. Steel sash window frames: Remove glass for recycling.
- D. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- E. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- F. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- G. Carpet Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  1. Store clean, dry carpet in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- H. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- I. Conduit: Reduce conduit to straight lengths and store by type and size.

### 3.5 RECYCLING CONSTRUCTION WASTE

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

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

### 3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

### 3.7 ATTACHMENTS

- A. Form CWM-1 for construction waste identification.
- B. Form CWM-2 for demolition waste identification.
- C. Form CWM-3 for construction waste reduction work plan.
- D. Form CWM-4 for demolition waste reduction work plan.
- E. Form CWM-5 cost/revenue analysis of construction waste reduction work plan.
- F. Form CWM-6 cost/revenue analysis of demolition waste reduction work plan.
- G. Form CWM-7 for construction waste
- H. Form CWM-8 for demolition waste.

END OF SECTION

| FORM CWM-1: CONSTRUCTION WASTE IDENTIFICATION |                  |                                          |                    |                                           |                     |                           |                         |
|-----------------------------------------------|------------------|------------------------------------------|--------------------|-------------------------------------------|---------------------|---------------------------|-------------------------|
| MATERIAL CATEGORY                             | GENERATION POINT | EST. QUANTITY OF MATERIALS RECEIVED* (A) | EST. WASTE - % (B) | TOTAL EST. QUANTITY OF WASTE* (C = A X B) | EST. VOLUME CY (CM) | EST. WEIGHT TONS (TONNES) | REMARKS AND ASSUMPTIONS |
| Packaging: Cardboard                          |                  |                                          |                    |                                           |                     |                           |                         |
| Packaging: Boxes                              |                  |                                          |                    |                                           |                     |                           |                         |
| Packaging: Plastic Sheet or Film              |                  |                                          |                    |                                           |                     |                           |                         |
| Packaging: Polystyrene                        |                  |                                          |                    |                                           |                     |                           |                         |
| Packaging: Pallets or Skids                   |                  |                                          |                    |                                           |                     |                           |                         |
| Packaging: Crates                             |                  |                                          |                    |                                           |                     |                           |                         |
| Packaging: Paint Cans                         |                  |                                          |                    |                                           |                     |                           |                         |
| Packaging: Plastic Pails                      |                  |                                          |                    |                                           |                     |                           |                         |
| Site-Clearing Waste                           |                  |                                          |                    |                                           |                     |                           |                         |
| Masonry or CMU                                |                  |                                          |                    |                                           |                     |                           |                         |
| Lumber: Cut-Offs                              |                  |                                          |                    |                                           |                     |                           |                         |
| Lumber: Warped Pieces                         |                  |                                          |                    |                                           |                     |                           |                         |
| Plywood or OSB (scraps)                       |                  |                                          |                    |                                           |                     |                           |                         |
| Wood Forms                                    |                  |                                          |                    |                                           |                     |                           |                         |
| Wood Waste Chutes                             |                  |                                          |                    |                                           |                     |                           |                         |
| Wood Trim (cut-offs)                          |                  |                                          |                    |                                           |                     |                           |                         |
| Metals                                        |                  |                                          |                    |                                           |                     |                           |                         |
| Insulation                                    |                  |                                          |                    |                                           |                     |                           |                         |
| Roofing                                       |                  |                                          |                    |                                           |                     |                           |                         |
| Joint Sealant Tubes                           |                  |                                          |                    |                                           |                     |                           |                         |
| Gypsum Board (scraps)                         |                  |                                          |                    |                                           |                     |                           |                         |
| Carpet and Pad (scraps)                       |                  |                                          |                    |                                           |                     |                           |                         |
| Piping                                        |                  |                                          |                    |                                           |                     |                           |                         |
| Electrical Conduit                            |                  |                                          |                    |                                           |                     |                           |                         |
| Other:                                        |                  |                                          |                    |                                           |                     |                           |                         |

\* Insert units of measure.

| <b>FORM CWM-2: DEMOLITION WASTE IDENTIFICATION</b> |                      |                                |                                      |                                |
|----------------------------------------------------|----------------------|--------------------------------|--------------------------------------|--------------------------------|
| <b>MATERIAL DESCRIPTION</b>                        | <b>EST. QUANTITY</b> | <b>EST. VOLUME<br/>CY (CM)</b> | <b>EST. WEIGHT<br/>TONS (TONNES)</b> | <b>REMARKS AND ASSUMPTIONS</b> |
| Asphaltic Concrete Paving                          |                      |                                |                                      |                                |
| Concrete                                           |                      |                                |                                      |                                |
| Brick                                              |                      |                                |                                      |                                |
| CMU                                                |                      |                                |                                      |                                |
| Lumber                                             |                      |                                |                                      |                                |
| Plywood and OSB                                    |                      |                                |                                      |                                |
| Wood Paneling                                      |                      |                                |                                      |                                |
| Wood Trim                                          |                      |                                |                                      |                                |
| Miscellaneous Metals                               |                      |                                |                                      |                                |
| Structural Steel                                   |                      |                                |                                      |                                |
| Rough Hardware                                     |                      |                                |                                      |                                |
| Insulation                                         |                      |                                |                                      |                                |
| Roofing                                            |                      |                                |                                      |                                |
| Doors and Frames                                   |                      |                                |                                      |                                |
| Door Hardware                                      |                      |                                |                                      |                                |
| Windows                                            |                      |                                |                                      |                                |
| Glazing                                            |                      |                                |                                      |                                |
| Acoustical Tile                                    |                      |                                |                                      |                                |
| Carpet                                             |                      |                                |                                      |                                |
| Carpet Pad                                         |                      |                                |                                      |                                |
| Demountable Partitions                             |                      |                                |                                      |                                |
| Equipment                                          |                      |                                |                                      |                                |
| Cabinets                                           |                      |                                |                                      |                                |
| Plumbing Fixtures                                  |                      |                                |                                      |                                |
| Piping                                             |                      |                                |                                      |                                |
| Piping Supports and Hangers                        |                      |                                |                                      |                                |
| Valves                                             |                      |                                |                                      |                                |
| Sprinklers                                         |                      |                                |                                      |                                |
| Mechanical Equipment                               |                      |                                |                                      |                                |
| Electrical Conduit                                 |                      |                                |                                      |                                |
| Copper Wiring                                      |                      |                                |                                      |                                |
| Light Fixtures                                     |                      |                                |                                      |                                |
| Lamps                                              |                      |                                |                                      |                                |
| Lighting Ballasts                                  |                      |                                |                                      |                                |
| Electrical Devices                                 |                      |                                |                                      |                                |
| Switchgear and Panelboards                         |                      |                                |                                      |                                |
| Transformers                                       |                      |                                |                                      |                                |
| Other:                                             |                      |                                |                                      |                                |

| FORM CWM-3: CONSTRUCTION WASTE REDUCTION WORK PLAN |                  |                                            |                                    |                                    |                                                |                                      |
|----------------------------------------------------|------------------|--------------------------------------------|------------------------------------|------------------------------------|------------------------------------------------|--------------------------------------|
| MATERIAL CATEGORY                                  | GENERATION POINT | TOTAL EST. QUANTITY OF WASTE TONS (TONNES) | DISPOSAL METHOD AND QUANTITY       |                                    |                                                | HANDLING AND TRANSPORTION PROCEDURES |
|                                                    |                  |                                            | EST. AMOUNT SALVAGED TONS (TONNES) | EST. AMOUNT RECYCLED TONS (TONNES) | EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES) |                                      |
| Packaging: Cardboard                               |                  |                                            |                                    |                                    |                                                |                                      |
| Packaging: Boxes                                   |                  |                                            |                                    |                                    |                                                |                                      |
| Packaging: Plastic Sheet or Film                   |                  |                                            |                                    |                                    |                                                |                                      |
| Packaging: Polystyrene                             |                  |                                            |                                    |                                    |                                                |                                      |
| Packaging: Pallets or Skids                        |                  |                                            |                                    |                                    |                                                |                                      |
| Packaging: Crates                                  |                  |                                            |                                    |                                    |                                                |                                      |
| Packaging: Paint Cans                              |                  |                                            |                                    |                                    |                                                |                                      |
| Packaging: Plastic Pails                           |                  |                                            |                                    |                                    |                                                |                                      |
| Site-Clearing Waste                                |                  |                                            |                                    |                                    |                                                |                                      |
| Masonry or CMU                                     |                  |                                            |                                    |                                    |                                                |                                      |
| Lumber: Cut-Offs                                   |                  |                                            |                                    |                                    |                                                |                                      |
| Lumber: Warped Pieces                              |                  |                                            |                                    |                                    |                                                |                                      |
| Plywood or OSB (scraps)                            |                  |                                            |                                    |                                    |                                                |                                      |
| Wood Forms                                         |                  |                                            |                                    |                                    |                                                |                                      |
| Wood Waste Chutes                                  |                  |                                            |                                    |                                    |                                                |                                      |
| Wood Trim (cut-offs)                               |                  |                                            |                                    |                                    |                                                |                                      |
| Metals                                             |                  |                                            |                                    |                                    |                                                |                                      |
| Insulation                                         |                  |                                            |                                    |                                    |                                                |                                      |
| Roofing                                            |                  |                                            |                                    |                                    |                                                |                                      |
| Joint Sealant Tubes                                |                  |                                            |                                    |                                    |                                                |                                      |
| Gypsum Board (scraps)                              |                  |                                            |                                    |                                    |                                                |                                      |
| Carpet and Pad (scraps)                            |                  |                                            |                                    |                                    |                                                |                                      |
| Piping                                             |                  |                                            |                                    |                                    |                                                |                                      |
| Electrical Conduit                                 |                  |                                            |                                    |                                    |                                                |                                      |
| Other:                                             |                  |                                            |                                    |                                    |                                                |                                      |

| FORM CWM-4: DEMOLITION WASTE REDUCTION WORK PLAN |                  |                                            |                                    |                                    |                                                |                                      |
|--------------------------------------------------|------------------|--------------------------------------------|------------------------------------|------------------------------------|------------------------------------------------|--------------------------------------|
| MATERIAL CATEGORY                                | GENERATION POINT | TOTAL EST. QUANTITY OF WASTE TONS (TONNES) | DISPOSAL METHOD AND QUANTITY       |                                    |                                                | HANDLING AND TRANSPORTION PROCEDURES |
|                                                  |                  |                                            | EST. AMOUNT SALVAGED TONS (TONNES) | EST. AMOUNT RECYCLED TONS (TONNES) | EST. AMOUNT DISPOSED TO LANDFILL TONS (TONNES) |                                      |
| Asphaltic Concrete Paving                        |                  |                                            |                                    |                                    |                                                |                                      |
| Concrete                                         |                  |                                            |                                    |                                    |                                                |                                      |
| Brick                                            |                  |                                            |                                    |                                    |                                                |                                      |
| CMU                                              |                  |                                            |                                    |                                    |                                                |                                      |
| Lumber                                           |                  |                                            |                                    |                                    |                                                |                                      |
| Plywood and OSB                                  |                  |                                            |                                    |                                    |                                                |                                      |
| Wood Paneling                                    |                  |                                            |                                    |                                    |                                                |                                      |
| Wood Trim                                        |                  |                                            |                                    |                                    |                                                |                                      |
| Miscellaneous Metals                             |                  |                                            |                                    |                                    |                                                |                                      |
| Structural Steel                                 |                  |                                            |                                    |                                    |                                                |                                      |
| Rough Hardware                                   |                  |                                            |                                    |                                    |                                                |                                      |
| Insulation                                       |                  |                                            |                                    |                                    |                                                |                                      |
| Roofing                                          |                  |                                            |                                    |                                    |                                                |                                      |
| Doors and Frames                                 |                  |                                            |                                    |                                    |                                                |                                      |
| Door Hardware                                    |                  |                                            |                                    |                                    |                                                |                                      |
| Windows                                          |                  |                                            |                                    |                                    |                                                |                                      |
| Glazing                                          |                  |                                            |                                    |                                    |                                                |                                      |
| Acoustical Tile                                  |                  |                                            |                                    |                                    |                                                |                                      |
| Carpet                                           |                  |                                            |                                    |                                    |                                                |                                      |
| Carpet Pad                                       |                  |                                            |                                    |                                    |                                                |                                      |
| Demountable Partitions                           |                  |                                            |                                    |                                    |                                                |                                      |
| Equipment                                        |                  |                                            |                                    |                                    |                                                |                                      |
| Cabinets                                         |                  |                                            |                                    |                                    |                                                |                                      |
| Plumbing Fixtures                                |                  |                                            |                                    |                                    |                                                |                                      |
| Piping                                           |                  |                                            |                                    |                                    |                                                |                                      |
| Supports and Hangers                             |                  |                                            |                                    |                                    |                                                |                                      |
| Valves                                           |                  |                                            |                                    |                                    |                                                |                                      |
| Sprinklers                                       |                  |                                            |                                    |                                    |                                                |                                      |
| Mechanical Equipment                             |                  |                                            |                                    |                                    |                                                |                                      |
| Electrical Conduit                               |                  |                                            |                                    |                                    |                                                |                                      |
| Copper Wiring                                    |                  |                                            |                                    |                                    |                                                |                                      |
| Light Fixtures                                   |                  |                                            |                                    |                                    |                                                |                                      |
| Lamps                                            |                  |                                            |                                    |                                    |                                                |                                      |
| Lighting Ballasts                                |                  |                                            |                                    |                                    |                                                |                                      |
| Electrical Devices                               |                  |                                            |                                    |                                    |                                                |                                      |
| Switchgear and Panelboards                       |                  |                                            |                                    |                                    |                                                |                                      |
| Transformers                                     |                  |                                            |                                    |                                    |                                                |                                      |
| Other:                                           |                  |                                            |                                    |                                    |                                                |                                      |

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

| FORM CWM-6: COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
|---------------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------|--------------------------------------------------|----------------------------------------------|----------------------------------------------|--------------------------------------------|--------------------------------------------------------|------------------------------------------------------|
| MATERIALS                                                                 | TOTAL QUANTITY<br>OF MATERIALS<br>(VOL. OR WEIGHT)<br>(A) | EST. COST OF<br>DISPOSAL<br>(B) | TOTAL EST.<br>COST OF<br>DISPOSAL<br>(C = A X B) | REVENUE FROM<br>SALVAGED<br>MATERIALS<br>(D) | REVENUE FROM<br>RECYCLED<br>MATERIALS<br>(E) | LANDFILL<br>TIPPING FEES<br>AVOIDED<br>(F) | HANDLING AND<br>TRANSPORTATION<br>COSTS AVOIDED<br>(G) | NET COST<br>SAVINGS OF<br>WORK PLAN<br>(H = D+E+F+G) |
| Asphaltic Concrete Paving                                                 |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Concrete                                                                  |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Brick                                                                     |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| CMU                                                                       |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Lumber                                                                    |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Plywood and OSB                                                           |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Wood Paneling                                                             |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Wood Trim                                                                 |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Miscellaneous Metals                                                      |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Structural Steel                                                          |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Rough Hardware                                                            |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Insulation                                                                |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Roofing                                                                   |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Doors and Frames                                                          |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Door Hardware                                                             |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Windows                                                                   |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Glazing                                                                   |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Acoustical Tile                                                           |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Carpet                                                                    |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Carpet Pad                                                                |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Demountable Partitions                                                    |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Equipment                                                                 |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Cabinets                                                                  |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Plumbing Fixtures                                                         |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Piping                                                                    |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Supports and Hangers                                                      |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Valves                                                                    |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Sprinklers                                                                |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Mech. Equipment                                                           |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Electrical Conduit                                                        |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Copper Wiring                                                             |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Light Fixtures                                                            |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Lamps                                                                     |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Lighting Ballasts                                                         |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Electrical Devices                                                        |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Switchgear and Panelboards                                                |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Transformers                                                              |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |
| Other:                                                                    |                                                           |                                 |                                                  |                                              |                                              |                                            |                                                        |                                                      |

# **FORM CWM-7: CONSTRUCTION WASTE REDUCTION PROGRESS REPORT**

| MATERIAL CATEGORY                | GENERATION POINT | TOTAL QUANTITY OF WASTE TONS (TONNES) (A) | QUANTITY OF WASTE SALVAGED |                          | QUANTITY OF WASTE RECYCLED |                          | TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C) | TOTAL QUANTITY OF WASTE RECOVERED % (D / A X 100) |
|----------------------------------|------------------|-------------------------------------------|----------------------------|--------------------------|----------------------------|--------------------------|-------------------------------------------------------------|---------------------------------------------------|
|                                  |                  |                                           | ESTIMATED TONS (TONNES)    | ACTUAL TONS (TONNES) (B) | ESTIMATED TONS (TONNES)    | ACTUAL TONS (TONNES) (C) |                                                             |                                                   |
| Packaging: Cardboard             |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Packaging: Boxes                 |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Packaging: Plastic Sheet or Film |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Packaging: Polystyrene           |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Packaging: Pallets or Skids      |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Packaging: Crates                |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Packaging: Paint Cans            |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Packaging: Plastic Pails         |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Site-Clearing Waste              |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Masonry or CMU                   |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Lumber: Cut-Offs                 |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Lumber: Warped Pieces            |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Plywood or OSB (scraps)          |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Wood Forms                       |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Wood Waste Chutes                |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Wood Trim (cut-offs)             |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Metals                           |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Insulation                       |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Roofing                          |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Joint Sealant Tubes              |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Gypsum Board (scraps)            |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Carpet and Pad (scraps)          |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Piping                           |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Electrical Conduit               |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Other:                           |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |

**FORM CWM-8: DEMOLITION WASTE REDUCTION PROGRESS REPORT**

| MATERIAL CATEGORY          | GENERATION POINT | TOTAL QUANTITY OF WASTE TONS (TONNES) (A) | QUANTITY OF WASTE SALVAGED |                          | QUANTITY OF WASTE RECYCLED |                          | TOTAL QUANTITY OF WASTE RECOVERED TONS (TONNES) (D = B + C) | TOTAL QUANTITY OF WASTE RECOVERED % (D / A X 100) |
|----------------------------|------------------|-------------------------------------------|----------------------------|--------------------------|----------------------------|--------------------------|-------------------------------------------------------------|---------------------------------------------------|
|                            |                  |                                           | ESTIMATED TONS (TONNES)    | ACTUAL TONS (TONNES) (B) | ESTIMATED TONS (TONNES)    | ACTUAL TONS (TONNES) (C) |                                                             |                                                   |
| Asphaltic Concrete Paving  |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Concrete                   |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Brick                      |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| CMU                        |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Lumber                     |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Plywood and OSB            |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Wood Paneling              |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Wood Trim                  |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Miscellaneous Metals       |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Structural Steel           |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Rough Hardware             |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Insulation                 |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Roofing                    |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Doors and Frames           |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Door Hardware              |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Windows                    |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Glazing                    |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Acoustical Tile            |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Carpet                     |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Carpet Pad                 |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Demountable Partitions     |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Equipment                  |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Cabinets                   |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Plumbing Fixtures          |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Piping                     |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Supports and Hangers       |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Valves                     |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Sprinklers                 |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Mechanical Equipment       |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Electrical Conduit         |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Copper Wiring              |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Light Fixtures             |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Lamps                      |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Lighting Ballasts          |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Electrical Devices         |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Switchgear and Panelboards |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Transformers               |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |
| Other:                     |                  |                                           |                            |                          |                            |                          |                                                             |                                                   |

## SECTION 033053 - MISCELLANEOUS CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes cast-in-place concrete, including reinforcement, concrete materials, mixture design, placement procedures, and finishes.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.

#### 1.4 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

### PART 2 - PRODUCTS

#### 2.1 CONCRETE, GENERAL

- A. Comply with the following sections of ACI 301 unless modified by requirements in the Contract Documents:
  - 1. "General Requirements."
  - 2. "Formwork and Formwork Accessories."
  - 3. "Reinforcement and Reinforcement Supports."
  - 4. "Concrete Mixtures."
  - 5. "Handling, Placing, and Constructing."
- B. Comply with ACI 117.

#### 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 1064, as drawn.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.3 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
  - 1. Portland Cement: ASTM C 150, Type II.
  - 2. Fly Ash: ASTM C 618, Class C or F.
  - 3. Slag Cement: ASTM C 989, Grade 100 or 120.
- C. Normal-Weight Aggregate: ASTM C 33, 1-1/2-inch nominal maximum aggregate size.
- D. Lightweight Aggregate: ASTM C 330, 1-inch nominal maximum aggregate size.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494, Type A.
  - 2. Retarding Admixture: ASTM C 494, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.
- G. Water: ASTM C 94.

## 2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth or cotton mats.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

## 2.5 CONCRETE MIXTURES

- A. Comply with ACI 301.
- B. Normal-Weight Concrete:
  - 1. Minimum Compressive Strength: 3000 psi at 28 days.
  - 2. Maximum W/C Ratio: 0.50.
  - 3. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

4. Slump Limit: 4 inches plus or minus 1 inch.
5. Air Content: Maintain within range permitted by ACI 301. Do not allow air content of trowel-finished floor slabs to exceed 3 percent.

## 2.6 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.
  1. When air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 FORMWORK INSTALLATION

- A. Design, construct, erect, brace, and maintain formwork according to ACI 301 (ACI 301M).

### 3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

### 3.3 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
  1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

### 3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least [one-fourth] <Insert depth> of concrete thickness, as follows:
  1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

### 3.5 CONCRETE PLACEMENT

- A. Comply with ACI 301 for placing concrete.
- B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
- C. Do not add water to concrete during delivery, at Project site, or during placement.
- D. Consolidate concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
- E. Foundations:
  1. Coordinate sizes and locations of concrete bases with actual equipment provided.
  2. Construct concrete bases 6 inches high unless otherwise indicated; and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
  3. Minimum Compressive Strength: 3000 psi at 28 days.
  4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor them into structural concrete substrate.
  5. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  6. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

### 3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding 1/2 inch (13 mm).
  1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm).
  1. Apply to concrete surfaces exposed to public view.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.7 FINISHING UNFORMED SURFACES

- A. General: Comply with ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Screed surfaces with a straightedge and strike off. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane before excess moisture or bleedwater appears on surface.

1. Do not further disturb surfaces before starting finishing operations.
- C. Float Finish: Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, fluid-applied or direct-to-deck-applied membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: Apply a hard trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
- E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset methods. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- F. Slip-Resistive Broom Finish: Apply a slip-resistive finish to surfaces indicated and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

### 3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure formed and unformed concrete for at least seven days by one or a combination of the following methods:
  1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
  2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
  3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests: Perform according to ACI 301.
  1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. Yd., plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
  2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

END OF SECTION

## SECTION 055000 - METAL FABRICATIONS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Steel framing and supports for mechanical and electrical equipment.
  - 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  - 3. Metal bollards.
- B. Products furnished, but not installed, under this Section:
  - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
- C. Related Sections:
  - 1. Slotted-channel inserts, wedge-type inserts, and other items cast into concrete.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Paint products.
  - 2. Grout.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
  - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

## 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

## 1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

## 1.8 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

## PART 2 - PRODUCTS

### 2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

### 2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36.
- B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
- C. Steel Pipe: ASTM A 53, standard weight (Schedule 40) unless otherwise indicated.
- D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
  - 2. Material: Cold-rolled steel, ASTM A 1008, structural steel, Grade 33; 0.0677-inch (14 gage) minimum thickness; hot-dip galvanized after fabrication.
- E. Cast Iron: Either gray iron, ASTM A 48, or malleable iron, ASTM A 47, unless otherwise indicated.

### 2.3 NONFERROUS METALS

- A. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- B. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- C. Aluminum Castings: ASTM B 26, Alloy 443.0-F.

## 2.4 FASTENERS

- A. General: Unless otherwise indicated, provide **Type 304** stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 194, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 with hex nuts, ASTM A 563, Grade C3 and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Eyebolts: ASTM A 489.
- G. Machine Screws: ASME B18.6.3.
- H. Lag Screws: ASME B18.2.1.
- I. Wood Screws: Flat head, ASME B18.6.1.
- J. Plain Washers: Round, ASME B18.22.1.
- K. Lock Washers: Helical, spring type, ASME B18.21.1.
- L. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- M. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47 malleable iron or ASTM A 27 cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- N. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593 (and nuts), ASTM F 594.

## 2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

- B. Shop Primers: Provide primers that comply with Section 099000 "Painting
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- G. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

## 2.6 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

## 2.7 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  1. Fabricate units from slotted channel framing where indicated.
  2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.
- D. Prime miscellaneous framing and supports with primer specified in Section 099000 "Painting" where indicated.

## 2.8 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
- B. Prime bollards with primer specified in Section 099600 "Painting"

## 2.9 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.
- C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.10 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153 for steel and iron hardware and with ASTM A 123 for other steel and iron products.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

## 2.11 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

- B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  - 1. Cast Aluminum: Heavy coat of bituminous paint.
  - 2. Extruded Aluminum: Two coats of clear lacquer.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

### 3.3 INSTALLING METAL BOLLARDS

- A. Anchor bollards in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
- B. Fill bollards solidly with concrete, mounding top surface to shed water.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

## SECTION 099000 - PAINTING

### PART 1: GENERAL

#### 1.1 SUMMARY:

- A. Included: Paint or otherwise finish all interior and exterior exposed surfaces, except as specifically excluded herein and as customarily excluded by general practices of the industry.
- B. Work Not Included:
  - 1. Do not include painting which is specified under other sections.
  - 2. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces and duct shafts.
  - 3. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section except as may be specified herein.
  - 4. Do not paint any moving parts of operating units; mechanical or electrical parts such as valve operators, linkages, sensing devices, and motor shafts, unless otherwise indicated.
  - 5. Do not paint over any required labels or equipment identification, performance rating, name, or nomenclature plates.
  - 6. Do not paint piping, conduit, panels and similar items in mechanical rooms, except when mechanical, storage, janitor or other such rooms are scheduled to receive a painters or integrally colored finish.
- C. Related Sections:
  - 1. Paint: Priming or priming and finishing of certain surfaces are specified to be factory performed or installer performed under other pertinent sections.

#### 1.2 DEFINITIONS:

- A. All coating system materials include primers, emulsions, epoxy, enamels, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

#### 1.3 SUBMITTALS:

- A. General: Submit the following according to Conditions of the contract and Division 1 Specifications Sections.
- B. Product Data: For each paint system specified:
  - 1. Manufacturer's technical information, including label analysis, instructions for handling, storage and application of each material.
  - 2. Material listing by cross referencing specific coating, finish system and application. Identify each material by the manufacturers catalog numbers and classification.
  - 3. Indicate by transmittal that a copy of each manufacturer's instructions have been submitted to the applicator.
- C. Certification: Manufacturers certification that products supplied comply with local regulations controlling use of volatile organic compounds (V.O.C.'s)
- D. Samples: Provide manufacturers color charts for initial color selection.

- E. Samples: For verification purposes provide four 12"x12" swatches of color and finish for each system specified on actual substrate and texture scheduled to receive finishes.

#### 1.4 QUALITY ASSURANCE:

- A. Qualifications of Manufacturers: Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of painting products and with a history of successful production acceptable to the Architect.
- B. Applicator Qualifications:
  - 1. Provide at least one person who shall be present at all times during execution of the work of this Section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this Section.
  - 2. Provide adequate numbers of workmen skilled in the necessary crafts and properly informed of the methods and materials to be used.
- C. Single-Source Responsibility: Provide primers and undercoat paint products produced by the same manufacturers as the finish coats.
- D. Paint Coordination:
  - 1. Provide finish coats which are compatible with the prime coats used.
  - 2. Review other sections of these Specifications as required, verifying the prime coats to be used and assuring compatibility of the total coating system for the various substrata.
  - 3. Upon request, furnish information on the characteristics of the specific finish materials to ensure that compatible prime coats are used.
  - 4. Provide barrier coats over noncompatible primers, or remove the primer and reprime as required.
  - 5. Notify the Architect in writing of anticipated problems in using the specified coating systems over prime coating supplied under other sections.
- E. Field Samples: On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color, and texture are obtained; simulate finished lighting conditions for review of in-place work.
  - 1. Final acceptance of colors will be from job-applied samples.
  - 2. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface according to the schedule or as specified.
    - a. After finishes are accepted, this room or surface will be used to evaluate coating systems of a similar nature.

#### 1.5 PRODUCT HANDLING:

- A. Delivery of Materials: Deliver all materials to the job site in original, new, and unopened containers bearing the manufacturer's name and label showing at least the following information:
  - 1. Name or title of the material
  - 2. Product description
  - 3. Manufacturer's stock number and date of manufacture
  - 4. Contents by volume, for pigment and vehicle constituents

5. Thinning instructions
6. Application instructions
7. Color name and number
8. M.S.D.S. sheets for each product specified.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg. C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

#### 1.6 JOB CONDITIONS:

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F. (10 deg C) and 90 deg F (32 deg C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg. F (7 deg C) and 95 deg F (35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
  1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

#### 1.7 PROTECTION:

- A. Protect adjacent surfaces from damage or defacement resulting from the work of this Section.

#### 1.8 EXTRA STOCK:

- A. Amount: Upon completion of the work of this Section, deliver to the Owner an extra stock equaling 5% of each color, type, and gloss of paint used on the work.
- B. Packaging: Tightly seal each container and clearly label with the contents and location used.

### PART 2: PRODUCTS

#### 2.1 PAINT MATERIALS:

- A. Design is based upon the use of paint products manufactured by PPG Industries, Inc., and the systems of that manufacturer are listed in the SCHEDULE OF PAINT SYSTEMS included in PART 3 of this Section. Commensurate products and systems of Dunn Edwards, Sherwin-Williams Company, Kelly-Moore or approved equal will be considered for approval. Products must comply with requirements of current regulations of the California Air Resources Board and local authority having jurisdiction.
- B. Durability: Provide paints of durable and washable quality. Do not use paint materials which will not withstand normal washing as required to remove pencil marks, ink, ordinary soil, and similar material without showing discoloration, loss of gloss, staining, or other damage.

- C. Colors and Glosses: The Architect will select colors to be used in the various types of paint specified and will be the sole judge of acceptability of the various glosses obtained from the material proposed to be used in the work.
- D. Undercoats and Thinners: Provide undercoat paint produced by the same manufacturer as the finish coat. Use only the thinners recommended by the paint manufacturer, and use only to the recommended limits. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.

## 2.2 APPLICATION EQUIPMENT:

- A. General: For application of the approved paint, use only such equipment as is recommended by the manufacturer of the particular paint, and as reviewed by the Architect.
- B. Compatibility: Prior to actual use of application equipment, use all means necessary to verify that the proposed equipment is actually compatible with the material to be applied and that the integrity of the finish will not be jeopardized by use of the proposed application equipment.

## 2.3 OTHER MATERIALS: All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new, first-quality of their respective kind, and as selected by the Contractor subject to review by the Architect.

# PART 3: EXECUTION

## 3.1 SURFACE CONDITIONS:

- A. Inspection: Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where the work of this Section may properly commence. Verify that painting may be completed in strict accordance with the original design and with the manufacturers' recommendations as reviewed by the Architect.
- B. Discrepancies: Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

## 3.2 MATERIALS PREPARATION:

- A. General:
  - 1. Mix and prepare painting materials in strict accordance with the manufacturer's recommendations.
  - 2. Store materials not in actual use in tightly covered containers.
  - 3. Maintain containers used in storage, mixing, and application of paint in a clean condition, free from foreign materials and residue.
- B. Stirring: Stir all materials before application and as required during application to produce a uniform mixture. Do not stir surface film which may develop into the material; strain the material if necessary before using.

### 3.3 SURFACE PREPARATION:

#### A. General:

1. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's recommendations as approved by the Architect.
2. Remove all removable items which are in place and are not scheduled to receive paint finish, or provide surface-applied protection prior to surface preparation and painting operations.
3. Following completion of painting in each space or area, reinstall the removed items by using workmen skilled in the necessary trades.
4. Clean and prepare each surface to be painted prior to applying paint or surface treatment.
5. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall onto wet newly painted surfaces.

#### B. Preparation of Wood Surfaces:

1. Clean all wood surfaces until they are free from dirt, oil, and all other foreign substance.
2. Smooth all finished wood surfaces exposed to view, using the proper sandpaper. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface.
3. Unless specifically directed by the Architect, do not proceed with painting of wood surfaces until the moisture content of the wood is 12% or less as measured by a moisture-meter.

#### C. Preparation of Metal Surfaces:

1. Thoroughly clean all surfaces until they are completely free from dirt, oil, and grease.
2. On galvanized surfaces, prepare per paint manufacturer's recommendations for specified paint system.
3. Allow to dry thoroughly before application of paint.

#### D. Preparation of Concrete, Plaster or Gypsum Wallboard Surfaces:

1. Thoroughly clean all surfaces until they are free of dust, dirt, oil and grease.
2. Patch holes and cracks to render patch as imperceptible as reasonably possible.

#### E. Surfaces Not Mentioned:

1. Prepare surfaces not mentioned above in accordance with manufacturer's printed directions. In the absence of manufacturer's directions, prepare in accordance with procedures customarily employed, subject to review by the Architect.

### 3.4 PAINT APPLICATION:

#### A. General:

1. Slightly vary the color of succeeding coats. Do not apply additional coats until the complete coat has been inspected. Only the inspected and reviewed coats of paint will be considered in determining the number of coats applied.
2. Sand and dust between enamel coats to remove all defects visible to the unaided eye from a distance of five feet.
3. On all removable panels and all hinged panels, paint the back sides to match the exposed sides.

B. Drying:

1. Allow sufficient drying time between coats. Modify the period as recommended by the material manufacturer to suit adverse weather conditions.

C. Brush Application: Brush out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, and other surface imperfections will not be acceptable.

D. Spray Application:

1. Confine spray application to metal framework and similar surfaces where hand brush work would be inferior.
2. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of two coats in one pass.

E. Exposed Plumbing, Mechanical and Electrical Items:

1. Except when specified otherwise, paint conduits, pipes, ducts, grilles, registers, vents, access panels and similar items to match adjacent wall and/or ceiling finish. Paint visible surfaces behind registers, etc., flat black. Do not paint valve stems and bonnets.

F. Doors: In addition to both faces of doors, paint all four edges. Paint surfaces inaccessible after doors are installed prior to hanging.

G. Drawers and Shelves: Provide one coat of clear lacquer or approved equal to all interior surfaces of drawers, concealed shelves and the interior of casework at shelves.

H. Repainting: Extend finish material to a corner or similar transitional line, i.e., blend-in paint at patched area. When required, painting an entire wall may be necessary to achieve a reasonably imperceptible appearance at patched area.

I. Completed work shall match the approved samples for color, texture, and coverage. Remove, refinish, or repaint all work not in compliance with specified requirements.

3.5 PAINT SYSTEMS:

- A. Paint system scheduled and noted on drawings. Refer to the complete corresponding paint systems as hereinafter specified. Major areas only are scheduled, but all miscellaneous items and areas within the room or space shall be treated with a suitable system.
- B. The number of coats specified is the minimum number acceptable. If full coverage is not obtained with the specified number, additional coats shall be applied without additional cost to the Owner, as necessary to produce a finish acceptable to Architect.

3.6 SURFACES NOT SPECIFIED:

- A. Other surfaces not included in the above schedule but which are scheduled or otherwise required to be painted shall be prepared and painted with a system selected by the Contractor subject to Architect's review.

## PAINT SYSTEMS SCHEDULE

| Surface     |                        | Finish Schedule Designation |                           |                                        | Manufacturer's System Designation |                                                                            |
|-------------|------------------------|-----------------------------|---------------------------|----------------------------------------|-----------------------------------|----------------------------------------------------------------------------|
| A. Interior |                        |                             |                           |                                        |                                   |                                                                            |
| (1)         | Gypsum Drywall         | P12.B                       | Semi-Gloss Latex Emulsion | 1 <sup>st</sup> Coat                   | 6-2                               | PPG Speedhide Interior Latex Primer Sealer 6-2.                            |
|             |                        |                             |                           | 2 <sup>nd</sup> Coat                   | 12-510                            | PPG SPEEDHIDE® Pro-EV Interior Enamel Latex Semi-Gloss 12-510 Series.      |
|             |                        |                             |                           | 3 <sup>rd</sup> Coat                   | 12-510                            | PPG SPEEDHIDE® Pro-EV Interior Enamel Latex Semi-Gloss 12-510 Series.      |
|             | (Textured)             | P12.E                       | Flat                      | 1 <sup>st</sup> Coat                   | 47-110                            | PPG MULTI-PRO™ Interior Flat Latex Wall & Ceiling Paint 47-110 Series.     |
| (2)         | Interior Ferrous Metal | P14.B                       | Semi-Gloss Latex          | 1 <sup>st</sup> Coat                   | 90-912                            | PPG Pitt-Tech® Plus Interior/Exterior DTM Industrial Primer 90-912 Series. |
|             |                        |                             |                           | 2 <sup>nd</sup> Coat                   | 90-912                            | PPG Pitt-Tech® Plus Interior/Exterior DTM Industrial Primer 90-912 Series. |
|             |                        |                             |                           | 3 <sup>rd</sup> & 4 <sup>th</sup> Coat | 12-510                            | PPG SPEEDHIDE® Pro-EV Interior Enamel Latex Semi-Gloss 12-510 Series.      |

|                    |                            |       |                                               |                                        |        |                                                                            |
|--------------------|----------------------------|-------|-----------------------------------------------|----------------------------------------|--------|----------------------------------------------------------------------------|
| <b>B. Exterior</b> |                            |       |                                               |                                        |        |                                                                            |
| (1)                | Exterior Plaster, Concrete | P50.E | Elastomeric (Medium Aggregate) 5 yr. warranty | 1 <sup>st</sup> Coat                   | 4-503  | PPG PERMA-CRETE® Concrete and Stucco Primer 4-503.                         |
|                    |                            |       |                                               | 2 <sup>nd</sup> Coat                   | 4-60   | PPG PERMA-CRETE® Medium Texture                                            |
| (2)                | Exterior Masonry           | P51.F | Clear Water Repellent                         | One Coat                               | 4-6200 | PPG PERMA-CRETE® Plex-Seal™ WB Interior/Exterior Clear Sealer 4-6200.      |
| (3)                | Exterior Ferrous Metal     | P55.C | Semi-Gloss                                    | 1 <sup>st</sup> Coat                   | 90-912 | PPG Pitt-Tech® Plus Interior/Exterior DTM Industrial Primer 90-912 Series. |
|                    |                            |       |                                               | 2 <sup>nd</sup> Coat                   | 90-912 | PPG Pitt-Tech® Plus Interior/Exterior DTM Industrial Primer 90-912 Series. |
|                    |                            |       |                                               | 3 <sup>rd</sup> & 4 <sup>th</sup> Coat | 78-45  | PPG Sun-Proof Exterior Semi-Gloss Acrylic Latex 78-45 Series.              |
| (4)                | Exterior Galvanized Metal  | P56.B | Flat, latex                                   | 1 <sup>st</sup> Coat                   | 90-912 | PPG Pitt-Tech® Plus Interior/Exterior DTM Industrial Primer 90-912 Series. |

| Surface |  | Finish Schedule Designation |             |                                        | Manufacturer's System Designation |                                                                                        |
|---------|--|-----------------------------|-------------|----------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------|
|         |  |                             |             | 2 <sup>nd</sup> & 3 <sup>rd</sup> Coat | 76-45<br>76-110                   | PPG SUN-PROOF® Exterior House and Trim Satin Latex 100% Acrylic 76-45 Series (76-110)  |
|         |  | P56.C                       | Semi-Gloss  | 1 <sup>st</sup> Coat                   | 90-912                            | PPG Pitt-Tech® Plus Interior/Exterior DTM Industrial Primer 90-912 Series.             |
|         |  |                             |             | 2 <sup>nd</sup> & 3 <sup>rd</sup> Coat | 78-45                             | PPG Sun-Proof Exterior Semi-Gloss Acrylic Latex 78-45 Series.                          |
|         |  | P56.D                       | Gloss       | 1 <sup>st</sup> Coat                   | 90-912                            | PPG Pitt-Tech® Plus Interior/Exterior DTM Industrial Primer 90-912 Series.             |
|         |  |                             |             | 2 <sup>nd</sup> Coat                   | 90-912                            | PPG Pitt-Tech® Plus Interior/Exterior DTM Industrial Primer 90-912 Series.             |
|         |  | P56.E                       | Elastomeric | 3 <sup>rd</sup> & 4 <sup>th</sup> Coat | 90-1310                           | PPG Pitt-Tech® Plus Interior/Exterior High Gloss DTM Industrial Enamel 90-1310 Series. |
|         |  |                             |             | 1 <sup>st</sup> Coat                   | 90-912                            | PPG Pitt-Tech® Plus Interior/Exterior DTM Industrial Primer 90-912 Series.             |
|         |  |                             |             | 2 <sup>nd</sup> Coat                   | 4-110                             | PPG PERMA-CRETE® Pitt-Flex Elastomeric Coating 4-110.                                  |
|         |  |                             |             | Spray Application                      | 4-110                             | PPG PERMA-CRETE® Pitt-Flex Elastomeric Coating 4-110.                                  |

END OF SECTION

## SECTION 266000 - GENERAL CONDITIONS FOR ELECTRICAL WORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary conditions, Divisions 0 and 1, specifications apply to work of this section.

#### 1.2 GENERAL

- A. All work must conform to the requirements which fall within the scope of the regulations in the Codes or under the jurisdiction of any of the governing bodies listed.
- B. The California Code of Regulations, Titles 19 thru 24.
- C. The California Electrical Code as applicable under current state and local regulations (latest edition and supplements).
- D. State Board of Health.
- E. CAL-OSHA Regulations.
- F. Nothing in these Specifications or shown on the plans shall relieve the Contractor from full compliance with applicable portions of any of the above regulations pertaining to work which is installed under this Contract.

#### 1.3 PERMITS AND FEES

- A. Pay for and obtain all permits, inspection fees, etc., as required for the completion of all work included in this Contract. Any inspection Certificates required shall be obtained and delivered to the Owner.

#### 1.4 EXAMINATION OF DRAWINGS AND SITE

- A. Before submitting the bid, the Contractor shall carefully examine the Architectural, Structural, Mechanical and Plumbing Drawings for this work, along with the Specifications for same in addition to the drawings and specifications governing the work of this trade. The Contractor shall also visit the site of the proposed construction and familiarize himself with all the site conditions. No subsequent allowances will be made to the Contractor because of negligence in complying with the above or alleged inability to understand the requirements.

#### 1.5 CONDUCT OF THE WORK

- A. The Contractor shall maintain on the job a competent foreman or a superintendent at all times to superintend the work.

#### 1.6 CONTRACTOR'S RESPONSIBILITY

- A. The Contractor shall be responsible for the safety and good condition of all materials and equipment until final acceptance by the Owner. The Contractor shall erect and maintain suitable barriers, protective devices, lights, and warning signs where required for the protection of the

public and employees about the buildings. The Contractor shall be fully responsible for any loss or injury to persons or property resulting from neglect or the carelessness and neglect by the Contractor's employees.

## 1.7 SUBMITTALS

- A. Shop drawings of power, signal, service, and distribution equipment and lighting fixture catalog cuts shall be submitted for approval in electronic format (PDF).
- B. All shop drawings shall be submitted at one time in a neat and orderly fashion in electronic format (PDF) with a title sheet including Project, Engineer and Contractor, table of contents. All items shall be identified by the specification paragraph number for which they are proposed. All equipment shall also be identified by the mark number as indicated on drawings.
- C. Equipment or material furnished or incorporated in construction without prior approval of the Architect may be rejected and if rejected shall be removed from the structure and replaced with approved equipment or material at the Contractor's expense.

## 1.8 RECORD DRAWINGS

- A. See General Conditions.

## 1.9 CATALOG DATA AND OPERATING INSTRUCTIONS

- A. Upon completion of the work in this Contract, the Architect shall be furnished with a complete set of catalog data which describes each piece of equipment installed under this Contract. The catalog shall be bound in a set and shall be clearly labeled as to each item of equipment used.

## PART 2 – PRODUCTS

### 2.1 LIST OF MATERIALS

- A. Within thirty (30) calendar days after the award of the Contract, the Contractor shall submit PDF copies of a complete list of materials to be installed under this Contract, giving, in the case of each item of material to be used, the name of the article. All substitutes must be approved by the Architect as stipulated in Section 01620.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. The work as laid out is to some extent diagrammatic, and the location thereon indicated may be approximate only. The Contractor, therefore, shall install all the equipment, apparatus, conduit runs and the like as follows:
- B. Adhere to the location indicated as far as possible.
- C. Maintain ample head room in all rooms and passageways, clearance around all apparatus and equipment and under pipelines for unrestricted passage and for easy servicing of all apparatus, equipment, devices and the like.

- D. Verify the exact locations of all fixtures and other apparatus or devices as indicated on the drawings. In the event these drawings do not sufficiently indicate the locations for all such fixtures, apparatus or devices, the Contractor shall obtain the exact locations from the Architect.

### 3.2 VERIFICATION OF DIMENSIONS

- A. The Contractor shall, as work progresses, verify the dimensions of the spaces available for the installation of the work and shall assume full responsibility for the proper locations and grading of each portion thereof.
- B. Where the work requires connections to be made to equipment that is furnished and set in place by others, the Contractor shall obtain exact locations and rough-in dimensions from the manufacturer of such equipment and shall install the connections in a neat and professional manner.

### 3.3 CUTTING AND PATCHING

- A. This Contractor shall do all cutting and patching of the work for the installation of the equipment and materials as approved by the Architect and/or Engineer. All patching shall accurately match the adjoining work.

### 3.4 BORING

- A. Provide mechanical boring equipment to bore under existing asphalt, concrete, or other surfaces or objects as noted on the drawings. All borings shall be a minimum of 24" under the substrate material unless otherwise authorized by the Architect.
- B. Holes shall be bored not to exceed 1" larger diameter than the largest component remaining in the excavation.
- C. Water or air pressure jetting are not permitted, unless they comply with the following requirements:
  - 1. All surfaces of the hole can be visually inspected with 6' maximum length.
  - 2. All objects shall be supported continuously to prevent sagging.
  - 3. The hole shall be filled with compacted damp sand and inspected by the Project Inspector or Materials Testing Lab technician.

### 3.5 FOUNDATIONS AND SUPPORTS

- A. This Contractor shall provide all foundations, supports and hangers, etc., as required to install the equipment as specified or shown on the drawings. All equipment shall be supported, braced and cross-braced in such manner as to prevent sway and/or lateral movement.

### 3.6 EXCAVATION AND BACKFILLING

- A. Excavating required for the installation of the work shall be done by this Contractor. Underground lines outside the buildings shall be installed with a minimum cover of 24" except depth of utility services shall comply with respective utility company requirements.
- B. The conduit shall be laid on material described below to afford bearing for the full length of the conduit. Any part of the trench excavated below grade shall be corrected with thoroughly compacted material approved by the Architect.

- C. When the bottom uncovered at subgrade is soft and, in the opinion of the Architect, cannot support the conduit, a further depth shall be excavated and refilled to conduit foundation grade as required by the Architect.
- D. Backfill:
  - 1. 6" Below, Around, and to 6" Above Conduit: Material shall be sand. Place carefully around and on top of conduit, taking care not to disturb conduit. Consolidate with vibrator.
  - 2. 6" Above Conduit to Grade: Material shall be sandy or silty loam, free of lumps, laid in 6" layers, uniformly mixed to proper moisture, and compacted to required density. If backfill is determined to be suitable and required compaction is demonstrated by laboratory test, water compaction in 6" layers may be used, subject to review by Engineer.
- E. No excavation below the level of, or adjacent to, foundations of footings shall be made except in a manner approved by the Architect.
- F. A red or yellow tracer tape stating "CAUTION ELECTRIC LINE BURIED BELOW" shall be installed 12" above conduit, full length of trench.
- G. Electrical conduit shall not be run in excavations provided for plumbing or heating pipes, unless separated by a minimum of 12 inches.
- H. Verify location of all underground lines with Owner and utility companies before starting excavation. If any utility company facilities are identified and located within the perimeter of the building, the Contractor shall stop work, promptly notify the Architect, and secure instructions.
- I. Ten (10) days before doing any excavation or trenching, contact "Underground Service Alert," 1-800-642-2444, advise them of work schedule and comply with their recommendations.

### 3.7 CLEANING UP

- A. The Contractor shall keep the premises free from accumulations of waste material or rubbish. At the completion of the work, he shall remove all rubbish, tools, scaffolding and surplus materials from and about the buildings, leaving the premises in a clean condition.
- B. All exterior surfaces of exposed equipment and material shall be thoroughly cleaned of all dirt, cement, plaster and other debris, including the exterior surfaces of all conduit, conduit fittings, conduit hangers, insulation and the like.
- C. All surfaces to be painted shall be carefully wiped or otherwise cleaned; cracks and corners scraped out clean, grease and oil spots removed so that surfaces may receive paint without further preparation.
- D. All fixtures and plated materials shall be thoroughly cleaned and polished.

### 3.8 DAMAGE BY BREAKS

- A. The Contractor shall be responsible for all damage to any part of the premises caused by breaks in conduit or fixtures furnished and/or installed by him under this specification for a period of one (1) year from date of acceptance of the project by the Owner.

### 3.9 SITE CONDITIONS

- A. Where existing utilities are shown on the plans, extreme care shall be exercised in excavating near these utilities to avoid any damage thereto, and the Contractor shall be held responsible for any such damage caused by this operation.
- B. The general location and arrangement of conduit, equipment apparatus, etc., as shown in the drawings or herein specified and all installations shall be made in accordance therewith. Information on the drawings relative to existing services is approximate only. Minor deviations required to conform to actual locations shall be made without additional cost to Owner.
- C. Should existing utilities, not shown on the plans, be found during excavations, or identified, the Contractor shall promptly notify the Architect for instructions as to further action. Failure to do so will make the Contractor liable for any damage arising from the operations after discovery of such utilities not shown on the plans. These utilities shall be removed or relocated as directed by the Architect. An equitable adjustment in the Contract will be made for the additional work involved.
- D. The Contractor shall use special precautions where excavations are made in the areas near electrical ducts since they may be high voltage ducts. All such ducts shall be exposed by careful hand excavation so as not to damage the ducts or cause injury to personnel and shall be suitably marked with warning signs, barricades, etc. as required.

### 3.10 STANDARD PRACTICE

- A. All work not shown in complete details shall be installed in conformance with the best standard practice for the trade.

### 3.11 INTENT

- A. It is the intention to provide systems that are complete in every respect without further cost to the Owner. Anything not shown in drawings, or indicated in the specifications, but required for complete operating systems shall be included as part of this Contract. This shall include all connections to existing services.

### 3.12 SPECIAL NOTE

- A. Attention of Contractor is hereby called to all work covered by notes on the drawings. Work covered by notes must be furnished and installed whether it is specifically mentioned in these specifications or not.

### 3.13 GUARANTEE

- A. Except as otherwise specified, all materials, apparatus equipment furnished and installed under the Electrical Section of this specification shall be new and free from all defects. Should any trouble develop within a period of one (1) year from date of acceptance of the work, due to inferior or faulty material and/or workmanship, the trouble shall be corrected, and material and equipment replaced by the Contractor without expense to the Owner.

### 3.14 SERVICES

- A. The location of any existing utility services shown on the drawings is approximate and shall be checked by this Contractor for exact location. Refer to “EXCAVATION AND BACKFILLING” for additional requirements.

### 3.15 ACCESS OPENINGS

- A. It shall be the responsibility of the Contractor to provide sufficient and convenient access openings, panels, etc., in the building construction where required for the maintenance of, installation and/or removal of all equipment, or other items of the various systems and equipment.

### 3.16 PURCHASE ORDERS AND ACCEPTANCE

- A. The Contractor shall file with the Architect two (2) certified copies of all purchase orders, for materials, equipment, appliances, and rentals thereof within two (2) weeks from date of Notice to Proceed with the Contract if requested by the Architect.
- B. The Contractor shall file with the Architect two (2) certified copies of acceptance of purchase orders for materials, equipment, and appliances by the manufacturer, distributor, or wholesale house within six (6) weeks from the date of Notice to Proceed with the Contract if requested by the Architect.
- C. Failure to provide same within the stipulated time shall be deemed sufficient cause for the Architect to withhold certificates of payment for work completed or materials and equipment provided by the Contractor or subcontractors toward the completion of their Contracts.

END OF SECTION

FIPART 1 – GENERAL

1.1 REFERENCE STANDARDS

- A. UL 845 - Motor Control Centers; Current Edition, Including All Revisions.
- B. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary conditions, Divisions 0 and 1 and Section 26 6000 specifications apply to work of this section.

1.3 SCOPE OF WORK

- A. This portion of the work includes the furnishing of all labor and materials necessary for the complete wiring system to outlets and all equipment shown on the drawings or covered by this Section of the Specifications and other Division 26 and Division 28 sections of the Specifications. In general, the work includes the following:
  - 1. Complete system of branch circuit wiring, conduit and distribution equipment for lights, receptacles, and power.
  - 2. Furnish and install lighting panelboards, lamps, lighting fixtures, wall switches, convenience outlets, etc. as shown on drawings.
  - 3. All hangers, anchors, sleeves, chases, and supports for fixtures, all electrical equipment and materials.
  - 4. Furnish, install, and connect wire, conduit, and switches, etc. required for other equipment covered by other sections of these Specifications.
  - 5. All excavating and backfill as required for electrical work.
  - 6. The patching and repair of all work modified or damaged by the installation of work under this Contract.
  - 7. Outlet boxes and conduit system for telecommunications (voice and data).
  - 8. Demolition work.
  - 9. Terminal cabinets and backboards.
  - 10. The Contractor shall furnish and install all work necessary to make complete systems, whether or not such details are mentioned in these Specifications or shown on the drawings, but which are necessary in order to make complete working systems, excepting only those portions that are specifically mentioned therein or plainly marked on the accompanying drawings as being installed by other Contractors.
  - 11. Electrical Contractor must coordinate his work with the work of other trades so as to provide raceways, conductors and outlets in the correct location for the equipment served, including all built-in appliances, mechanical, and signal equipment and connect same. Electrical Contractor must provide power of the correct voltage and phase to each item of equipment.
  - 12. Before construction starts, the Electrical Contractor shall arrange a coordination meeting with the General Contractor and all other subcontractors supplying equipment that requires electrical connections. All electrical requirements shall be verified, and any problems shall be immediately reported to the Architect. Equipment items to verify shall include, but not be limited to: Voltage, amps, phase, location, orientation, space requirements, type of connection, starter and disconnect location and provision, control system operation and requirements, etc.
  - 13. The above list is given for the convenience of the Contractor and is not considered all-inclusive.

14. Complete system of conduits, substructures and equipment for power, telephone, and cable television services. The Electrical Contractor shall inform the respective utility companies that the project has been started and confirm that all forms, which are required for the Application for Service, have been completed and submitted to the Utility Company. The Electrical Contractor shall obtain a copy of the approved engineering drawings prior to construction.

#### 1.4 TEMPORARY CONSTRUCTION POWER

- A. Provide a temporary construction power system that is adequate for this project. Coordinate requirements and details with the General Contractor. All 120V, 15A and 20A receptacles shall have ground fault circuit interrupter protection.

#### 1.5 WORK NOT INCLUDED

- A. A. The furnishing and installation of motors.
- B. Access panels.

### PART 2 - MATERIALS

#### 2.1 GENERAL

- A. All materials, appliances, and equipment except that furnished by the Owner shall be new, bear U.L. Label and of the make, brand or quality specified or as accepted by the Architect as herein provided. This shall also apply to all parts of the work whether or not this particular paragraph is referred to by number.
- B. All apparatus, conduit systems, etc., shall be installed and interconnected so as to form complete systems as herein specified and/or shown on all the accompanying drawings. This Contractor shall furnish and install all work necessary to make complete working systems, excepting only those portions that are specifically mentioned herein or plainly marked on accompanying drawings as being furnished by other contractors.

#### 2.2 MAIN SWITCHBOARD

- A. Existing - no modifications expected.

#### 2.3 PANELBOARDS

- A. Existing panelboards: Provide new circuit breakers and/or adjustments as shown on drawings for new electrical OCPDs. Circuit breakers shall be new and match the existing panelboard in style, type and A.I.C. rating.
  1. For legacy manufactured existing equipment, contractor shall verify availability of new devices per the drawings. In instances where new devices are not available contractor shall present remanufactured devices for review by A/E team on a case-by-case basis.
- B. The panelboards shall be constructed in accordance with the standard set up by the Underwriters' Laboratories, Inc., and as manufactured by Square "D", General Electric, Eaton, Siemens or approved equal, and each shall contain the number and type of circuit breakers as indicated on the drawings. All circuit breakers, rated 100 amps and larger, shall be sub-feed type and equipped with adjustable instantaneous trip settings.

- C. The panelboards shall be equipped with a hinged lockable door, piano hinged trim, and typewritten circuit directory. All finish in offices, corridors, or areas subject to public view shall be prime coat for finish coat by painter. In storage rooms, equipment rooms, etc., finish shall be standard factory gray Hammertone. Provide a flush lock on all panelboards.
- D. Provide an engraved Bakelite nameplate, fastened with screws or rivets to the face of each panelboard, which will identify it.
- E. Any panel with an isolated ground bus shall have a nameplate stating, "IG CIRCUITS". Nameplate to be same size and color and adjacent to panel designation nameplate.
- F. Electrical contractor shall provide electronic PDF copies of detailed construction drawings for the panelboards and terminal cabinets shall be submitted to the Architect for Approval before their construction is started.

## 2.4 MAGNETIC STARTERS

- A. Motor Starters shall be across-the-line magnetic type rated in accordance with NEMA Standards, sizes, and horsepower ratings, mounted in general purpose enclosures, or NEMA 3R as required. All starters shall be full voltage, non-reversing, unless otherwise noted. Thermal overload relays on starters shall be non-compensated bimetallic type with selector for either auto or manual reset. Overload heater units shall be provided in each leg of starter unit. Each starter shall have 2 auxiliary interlock contacts.
- B. Each starter shall have 120-volt control transformer and HOA selector switch mounted on cover.

## 2.5 TERMINAL CABINETS

- A. Terminal cabinets shall be flush, or surface mounted as indicated with hinged doors and lock. The exterior finish to be same as for panelboards. Provide ¾" plywood backing inside of cabinet. Provide proper number of terminals in cabinets as required.
- B. Provide a Bakelite nameplate fastened with screws or rivets to the face of each terminal cabinet, which will identify it.
- C. Provide circuit directory and holder on inside of door with one line for each conductor entering and each conductor leaving cabinet.

## 2.6 RACEWAYS AND FITTINGS

- A. Shall be manufactured by Allied Tube and Conduit Corporation, AFC Cable Systems, Inc., Carlon, Cantex, PW Pipe or approved equal.
- B. Galvanized rigid steel conduits (RSC) may be used in all locations.
- C. For underground runs in direct contact with earth, conduit shall be wrapped with PVC tape or shall have factory applied PVC coating.
- D. Galvanized intermediate metallic conduit (IMC) may be used in indoor locations not in direct contact with earth.
- E. Galvanized electrical metallic tubing (EMT) may be used in indoor dry locations in which it is:
  - 1. Not subject to physical damage.

2. Not in direct contact with earth.
  3. Not in concrete slabs.
  4. Not in hazardous areas.
  5. On roof or walk cover when specifically shown on drawings.
  6. In masonry walls, not in the same cells as rebars.
- F. Non-metallic rigid conduit shall be PVC Schedule 40 and may be used:
1. Underground.
  2. Below concrete slab on grade.
  3. In concrete slab on floors above grade.
  4. In masonry walls, not in same cells as rebars.
- G. Flexible steel conduit may be used in dry locations for final connections to:
1. Motors, transformers, and other mechanical equipment, not to exceed 18 inches.
  2. Lighting fixtures, not to exceed 72 inches.
  3. Facilitate wiring in tight locations, when approved by Engineer.
- H. Flexible aluminum conduit may be used in walls or in attics to facilitate wiring in tight locations, when approved by the Engineer.
- I. Liquidtight flexible steel conduit shall be used in outdoor or wet locations for final connection to motors or other mechanical equipment, not to exceed 18 inches.
- J. Fittings:
1. For rigid and intermediate steel conduits, fittings shall be:
    - a. Galvanized rigid steel threaded type.
    - b. Provide insulated grounding bushings at switchboard enclosures and panel enclosures for feeders.
  2. For electrical metallic tubing (EMT), fittings shall be:
    - a. Zinc plated steel set screw type in dry locations.
    - b. Zinc plated steel compression type for conduits larger than 1", in wet locations and in masonry walls.
    - c. All connectors shall have an insulated throat.
  3. For non-metallic conduits, fittings shall be PVC Schedule 40 type. Use PVC schedule 40 adapters at all boxes and panelboards.
  4. Brush or dauber apply PVC cement.
  5. For flexible metallic conduits, fittings shall be zinc plated steel/malleable iron squeeze type.
  6. For liquidtight flexible metallic conduits, fittings shall be zinc plated steel/malleable iron compression type.
  7. Use of the following is prohibited:
    - a. Crimp-on, tap-on or indenter type fittings.
    - b. Spray (aerosol) PVC cement.

## 2.7 PULL BOXES

- A. Pull Boxes shall meet all code requirements as to size for conduits terminating therein and to thickness of material used in fabrication.

- B. Fabricated sheet steel pull boxes shall be installed only in dry, protected locations and shall be furnished with knockouts and removable screw cover. The box shall be finished with one coat of zinc chromate and a coat of primer sealer and where exposed to public view shall be painted to match the surrounding surface.
- C. Weatherproof sheet steel pull boxes shall be fabricated of code gauge galvanized sheet steel with two coats of rust resistant finish and shall be furnished with gasket and made completely weathertight.
- D. Approved manufacturers for metal boxes are Cooper B-Line, Milbank, Hoffman or approved equal.
- E. Weatherproof concrete pull boxes, junction boxes and telephone boxes shall be manufactured by Christy Concrete Products, Utility Vault or approved equal. All pull boxes shall be H/20 rated and be equipped with H/20 rated galvanized steel checker plate cover with the inscription "Electric, Lighting, Fire Alarm or Signal".

## 2.8 TIME SWITCHES

- A. Time switch shall be a minimum two-circuit digital astronomical time clock with photo control input, battery back-up and a surface enclosure. Provide a flush enclosure when indicated. Intermatic ET- Series or approved equal.

## 2.9 OUTLET BOXES

- A. All outlet boxes shall be standard one or two piece galvanized knockout outlet boxes. Racor, Appleton, Thomas and Betts or approved equal.
- B. All outlet box covers, rings or other fittings shall be standard galvanized. Racor, Appleton, Thomas and Betts or approved equal.
- C. No outlet box shall be smaller than four inches (4") square and 1 1/2" in depth, except in concrete block construction where Thomas and Betts concrete masonry boxes are approved.
- D. Floor outlets on grade shall be fully adjustable type floor boxes, suitable for use in concrete floors. Wiremold #RBA6C30 with a Wiremold #8CTC2NKTR Evolution cover assembly. Where floor box is installed in a bare concrete floor, provide a Bare Concrete and Terrazzo ring, Wiremold #RFB6E-CTR with a Wiremold #8CT2NKTR Evolution cover assembly.
- E. Cover shall be die-cast aluminum with nickel finish, unless otherwise noted on drawings. For 120V power, provide an industrial specification grade 20A 125V duplex receptacle with internal duplex receptacle bracket #RFB6DP, quantity as shown on drawings. For data/telephone, provide a decorator style receptacle bracket #RFB6GFI for mounting frame to accept the modular telephone/data jacks, unless otherwise noted on drawings. Any unused device compartments shall be covered with internal blank bracket #RFB6B.
- F. All special outlets shall be as hereinafter specified or as shown on drawings.
- G. Thru boxes are not permitted.
- H. Any unused boxes shall be equipped with a blank cover plate.

## 2.10 RECEPTACLES

- A. Furnish and install an industrial specification grade 20A, 125-volt, 3 wire grounding type tamper-resistant duplex receptacle with one piece brass mounting strap at all receptacle outlets as indicated on drawings. Leviton #5362-SGW or equal as manufactured by Hubbell, Pass and Seymour, Eaton, or other approved manufacturers.
- B. Device color shall be white.
- C. Tamper-resistant isolated ground duplex receptacles shall be 20A, 125V NEMA 5-20R, orange in color. Leviton #T5362-IG or approved equal.
- D. Tamper-resistant G.F.C.I. duplex receptacles shall be provided for 15 and 20-amp 125-volt circuits where required by the C.E.C. #210.8 and #590.6. At indoor locations, provide Leviton #G5362-0TW or equal. At exterior locations, provide weather and tamper-resistant type G.F.C.I. duplex receptacles, Leviton #G5362-WTW or equal. At damp locations, provide a diecast weatherproof lockable cover, RACO # 5028-0 or equal. At wet locations, provide a diecast weatherproof “while-in-use” lockable cover, Red Dot #CKSUV or equal.

## 2.11 LOCAL SWITCHES

- A. Furnish and install industrial specification grade, quiet type toggle switches, 20 AMP rated 120/277V AC only, controlling wall and ceiling outlets as indicated on the drawings. Leviton #1221-2W or equal as manufactured by Hubbell, Pass and Seymour, Cooper or other approved manufacturers.
- B. Where two or more switches are in proximity they shall be ganged in the same box, and they will be set under one plate. Switches controlling lights and/or outlets on emergency power shall be kept entirely independent of all other switches not on emergency power by mounting in a separate box.
- C. Special receptacles or switches shall be as noted on the drawings.
- D. Where key switches are noted on the drawings, provide Leviton #1221-2KL.
- E. Device color shall be white.
- F. When a switch is used as a disconnecting means, it shall be mounted in a readily accessible location.

## 2.12 WALL PLATES

- A. All wall plates for electrical outlets and devices shall be smooth stainless steel, non-magnetic type 302S.
- B. All telephone outlet plates shall be blanked plates, same as device plates.

## 2.13 CONDUCTORS (WIRE)

- A. All wire installed in this contract shall be of a standard manufacturer as approved by the National Board of Fire Underwriters and be of the size as indicated on the drawings. All wire shall bear the Underwriters’ label and shall be brought to the job in unbroken packages and approved by the Job Inspector before it is installed.

- B. All power conductors #10 AWG and smaller shall be type THWN copper, unless otherwise noted. All conductors #8 AWG and larger shall be type THWN-2 copper, unless otherwise noted.
- C. All underground conductors in a 480V or 480/277-volt power system shall be type XHHW-2 copper, unless otherwise noted.
- D. Number 12 AWG wire shall be the smallest gauge wire used, except for signal circuits, which shall be as shown on plans or as specified under other sections of these specifications.
- E. All wire #8 AWG gauge or larger shall be stranded.
- F. The neutral conductor of all lighting feeders shall be of the same size as the phase conductors.
- G. Splices on all wire less than #8 gauge shall be with insulated spring connectors Ideal "Wing Nuts", 3M "Scotchlok", or equal.
- H. Splices in wires #8 gauge and larger shall be made with crimp on solderless connector, 3M Scotch, Burndy or equal. Connectors to switches or bus bar shall be made with one-piece lugs for all wires, sized for conductors as shown on the plans.
- I. Each branch circuit shall be marked with the circuit number at the panel and at the first outlet nearest the panel. E-Z Code Markers (Thomas and Betts) or equal shall be used to label the circuits.

#### 2.14 LIGHTING FIXTURES

- A. This Contractor shall submit for approval electronic portfolios, PDF format, with full description and manufacturer data sheets of all fixtures (including ballasts and lamps), that are proposed to use.
- B. This Contractor shall furnish and install all lighting fixtures and lamps as indicated on the Electrical Drawings and in accordance with these specifications.
- C. This Contractor shall be held responsible for the complete equipment of all fixture outlets with fixtures of the proper design as shown.
- D. All fixtures shall be securely anchored to prevent any possible chance of their falling.
- E. Continuous runs of fixtures shall be installed straight and true.
- F. Recessed fixtures shall be complete with plaster frames, supporting brackets and hanger wires.
- G. Stem lengths shall be adjusted to meet conditions where required. Furnish aligners to ensure vertical alignment (ball aligner).
- H. Electrical Contractor shall coordinate outlets with Acoustic Tile Contractor and other trades and locate outlets in the center or at intersections of acoustical tile in all acoustical tile ceilings.
- I. Recessed fixtures in t-bar ceilings shall be attached to t-bar ceiling with integral
- J. t-bar clips, two at each end of fixture.
- K. When the light fixture is equipped with an integral emergency battery pack, the light fixture shall be connected so that it is controlled via the room light switch and is automatically energized when power has fails.

## 2.15 PHOTO CONTROL

- A. Compatible with Time Clock, adjustable type.

## 2.16 MOTOR DISCONNECTS

- A. Disconnects shall be fused safety switches with dual element fuses. Heavy Duty rated with quick-make, quick-break operating mechanism. Fuse rating shall comply with motor manufacturer's recommendations. Switch shall be UL listed. Disconnects shall have an external operating handle, lockable in the open or closed position.
- B. Disconnect switches shall be located so as not to obscure any part of the HVAC unit's nameplate data.
- C. Each disconnect switch shall have an engraved Bakelite nameplate identifying the panel and circuit number that feeds the motor. Nameplates shall comply with specifications for "Identification of Switches and Apparatus".

## PART 3 - EXECUTION AND INSTALLATION

### 3.1 CONDUIT SYSTEMS

- A. A concealed conduit system shall be installed for all interior wiring including controls. Conduit shall be run continuously between outlets, etc., and with the minimum number of bends.
- B. PVC 40 shall be used for underground runs.
- C. Where underground conduit cannot be run below building footings and the Contractor shall provide PVC-80 sleeves through the footings (Contractor shall obtain approval for all sleeve sizes and locations with the Structural Engineer before installation).
- D. All conduit shall be delivered to the site of construction in their original bundles. Each length of conduit shall bear the label of the National Board of Fire Underwriters. All conduit subjected to rough usage while on the job before installation and not acceptable to the Architect shall be removed from the premises upon notice.
- E. Conduit installed in masonry walls shall be rigid steel galvanized conduit, PVC or EMT, not in same cell as re-bars.
- F. The joints in all conduits installed under concrete slabs on the ground, or underground, or exposed to the weather, shall be made liquid and gas tight. All underground conduit outside of the buildings shall be buried to a depth of not less than 24" below finish grade. Utility services shall comply with utility company requirements. Two or more conduit runs installed in a common trench shall be separated horizontally by at least four inches (4"). Electrical conduit runs installed in a common trench with other utility lines shall be separated horizontally from such lines by at least twelve inches (12"). Provide a detectable warning tape, 12" above the top of the conduit and the full length of trench.
- G. Changes in direction shall be made with conduit elbows or long radius bends made on the job. Where two or more conduits are grouped in exposed locations, the sweeps shall be struck from the same center forming concentric arcs.

- H. All joints in conduit shall be made with standard coupling. In making joints, conduits must be truly and accurately cut and threaded (where applicable) with straight thread, smoothly reamed and squarely butted. All conduit shall be kept corded and dry during construction, using plastic caps or conduit pennies held in place with conduit bushings. Should dirt or moisture collect in any conduit, the Contractor shall swab them out to the satisfaction of the Architect.
- I. Conduits ending at the motors shall be carried as close as possible to the terminal blocks making allowance for the movement of the motors when they are equipped with slide rails. The connection between the conduit terminals on the motor and the conduit shall be made with liquid-tight flexible conduit using the proper fittings.
- J. All conduits where they enter panel enclosures, pull boxes, or outlet boxes shall be secured in place by galvanized locknut inside of box.
- K. Where conduits are run exposed, they shall be installed straight and true with reference to the adjacent construction.
- L. Any conduit installed under the building shall be under the slab. The top of any conduit below floor slab shall be a minimum of 4" below the bottom of the concrete slab.
- M. All boxes for bracket outlets shall be equipped with a 3/8" "No-Bolt" fixture stud. These boxes shall be so set that when in place the fixture shall be at right angles to the ceiling or walls.
- N. All empty conduit shall be equipped with a nylon pull rope continuous from outlet-to-outlet or end-to-end.
- O. Flexible conduit will be permitted for connecting lighting fixtures to junction boxes.
- P. Flexible connections in outdoor and damp locations shall be flexible liquid-tight metal conduit or non-corrosive seamless metallic tubing with watertight connections.
- Q. Install roof jacks for this construction in accordance with other sections of this Specification.
- R. The maximum allowed length of flex conduit at equipment connections is 18".
- S. Expansion joints for conduit shall be provided where required to compensate for thermal expansion and contraction.
- T. At all sub-panels and terminal cabinets, stub two 1" C and two 3/4" C into the accessible attic space. If the attic space is not accessible, stub conduits to a location as directed by Architect or Engineer. Provide additional conduit stubs when indicated on the drawings.
- U. Support conduits on roof with prefabricated pipe supports (B-Line "Dura-Blok Series" or equal), spaced 8 ft. O.C. maximum. Minimum clearance from roof to framing channel shall be 4". Framing channel length shall be as required plus 50% spare length. Installation shall comply with manufacturer's recommendations.
- V. Any conduit entering underground pull boxes shall be sealed to prohibit water from entering the conduit. Conduits with conductors shall be sealed with a sealing compound after all conductors have been installed. All spare (empty) conduits shall be identified with either the "origination" or "destination" (example: to pull box 150' to the south, from Main Switchboard, etc.). The contractor shall use a scrap piece of 3/4" PVC conduit, approximately 5" in length and tie the nylon pull string thru it. Write the description on the conduit using an indelible/permanent marker.

### 3.2 OUTLETS

- A. In general, the locations of electrical outlets shall be as shown on the drawings; however, the Contractor shall make any changes necessary to suit conditions on the job or rearrangement of built-in fixtures and equipment as directed by the Architect or his representative.
- B. The Contractor shall study the general building plans with relation to spaces surrounding each outlet in order that his work may fit the work of others and that when fixtures or other equipment are installed, they will be symmetrically located according to room layout. Refer all conflicts and discrepancies promptly to the Architect.

### 3.3 OUTLET BOXES

- A. Outlets for concealed wiring shall be flush with the finished wall or ceiling surfaces. Pull boxes, junction boxes and all others to which no fixture or device is to be attached, shall be fitted with blank cover plates, and painted to match surroundings. In order to reduce noise transmission between rooms, outlet boxes shall not be installed back-to-back. Where outlets are side by side and faced into opposite rooms, the boxes shall be at least 6" apart, except in fire rated walls space boxes at least 24" apart. If the boxes are connected together, the connection shall be flexible and shall have openings packed with fiberglass.
- B. The Electrical Contractor shall inform himself of wall thickness throughout the building and shall provide outlet boxes of suitable depth that can be flush mounted and yet will be deep enough to contain the particular apparatus involved. The location of exposed pull or junction boxes will be subject to the Architect's approval.
- C. Outlets from which lights are suspended shall have approved 3/8" fixture studs fastened through from back of box. All outlet boxes and particularly those supporting fixtures shall be securely anchored in place in an approved manner. Support outlet boxes and fixtures in acoustic ceiling areas from building structures, not from acoustic ceilings. All lighting fixture outlets shall be coordinated with mechanical, architectural, or other equipment to eliminate conflicts and provide a workable, neat installation.
- D. Where more than one switch occurs at the same location, use multiple gang outlet boxes covered by a single plate; provide box partitions as required by the C.E.C. Switches controlling lights and/or outlets on emergency power shall be kept entirely independent of all other switches not on emergency power by mounting in a separate box.
- E. Outlet box extensions shall be UL listed and shall be attached to box with threaded metal screws. "Flash guards" are not permitted to be used as box extensions.

### 3.4 LOCATIONS OF OUTLETS

- A. The Architect reserves the right to make reasonable changes in the indicated locations before work is roughed in without additional charge to the Owner.
- B. Where wainscot occurs at the 4'-6" level, the switch shall be mounted lower in the wainscot as near the 4'-0" level as possible, but in no case, shall the switch be partially in the wainscot and partially in the wall. It shall be the Electrical Contractor's responsibility to verify all door swings. Switches, unless specifically noted, shall be on the strike side of the door. If switch is indicated on hinged side of door, verify location with Architect.

### 3.5 CONDUCTOR IDENTIFICATION AND INSTALLATION

- A. The drawings indicate the arrangement of outlets on each branch circuit and the circuit tags show the number of the circuit, and the board to which it will be connected.

- B. Circuits indicated with the same numbers shall be connected to the same breaker on the panelboard.
- C. All feeders and branch circuits shall be tagged in all pull boxes and in the gutters of all panels to which they connect.
- D. All wiring shall be done in identified neutrals.
- E. No wire shall be installed until all work of other contractors that might cause injury to the said wire has been completed. Care shall be used to pull wires to ensure that no damage occurs to the insulation. A wire lubricant shall be used for pulling in wires.
- F. In making the connection of all branch circuits to the terminals of switches, base plugs, etc., the wires shall be looped around the binding screws or be fitted with connecting lugs. At the ceiling outlets, this Contractor shall leave not less than 6" of free ends on each wire for connections to the fixtures.
- G. No splices shall be permitted except in outlet boxes, and in panelboard gutters.
- H. Switches and receptacles shall be securely fastened to the outlet box. Where the outlet box covers are back of the finished walls the switch or receptacle shall be built out from the same with washers so that it is rigidly held in place to the box. The floating of any switch or receptacle will not be permitted.
- I. All signal and communications conductors shall be identified in terminal cabinets as to type of system e.g.: clock, bell, fire alarm, etc. and location of other end of conductor by room number or name as directed by Owner. Identification shall be by numbers at terminal strips and a numbered directory in cardholder inside terminal cabinet.
- J. Fire alarm system cabling and wiring shall be color-coded as follows:
  - 1. Initiating Devices: Addressable cable, red jacket.
  - 2. Signaling Devices: Black and Red wires for horns, strobes or horn strobes.
  - 3. Speaker cable, blue jacket for speakers.
- K. All power wiring size #6 AWG and smaller, shall be factory color-coded. For larger than #6, mark conductors on each end and at all junction and/or pull boxes with a 1" band of colored pressure-sensitive plastic tape. For isolated ground wires, mark with a 1" band of green tape, followed by a 1" band of yellow tape, followed by a 1" band of green tape. Colors for each phase and the neutral shall be consistent throughout the system. Color code shall be as follows:
- L. The white or gray conductor shall be the neutral at each outlet. All switches shall be installed in "hot" leg. On all lighting circuits the switch leg shall be purple from switch to fixture. All travelers from switch to switch on 3 and 4-way switches shall be pink. This color code shall be followed by Contractor for all fixture whips except for factory-manufactured whips. When factory manufactured whips are used, color code shall apply to all wiring except the factory whip.
- M. Conductors having white, gray or green covering shall not be used to indicate anything other than neutral or grounding. This limitation applies to all power, lighting, and control circuits.
- N. Installation of conductors shall be made in a neat and workmanlike manner to meet Code requirements and shall be run continuous without weld, splice or joint between boxes. Do not install wires in conduit unless the entire system of conduit and outlet boxes is permanently in place. All conductors shall be pulled using a UL approved wire lubricant.

- O. Make all terminations at motors using 3M Series 5300 Motor Lead/Cable Splicing Kits. Make connections per 3M written installation procedures.
- P. On all bolted electrical connections, the Contractor shall use Belleville washers.
- Q. All wiring to be neatly bundled and tied with nylon cord or plastic straps.
- R. When approved by the Electrical Engineer, splices in underground pull boxes shall be made with crimp on compression connectors and insulated with heat shrink sleeves or with splice kits listed by the manufacturer for wet locations. Wire nuts are not permitted. Cables and/or conductors for fire alarm and signals systems shall not be spliced.

### 3.6 GROUNDING

- A. The conduit system supports, cabinets, switchboards, etc., and neutral conductors must be permanently and effectively grounded, in accordance with Title 24 of the California Code of Regulations. The neutral shall only be grounded at the main service location unless specifically noted otherwise on the drawings or required by the California Electrical Code.
- B. This Contractor shall exercise every precaution to obtain good contacts at all panel boxes, pull boxes, etc.: where it is not possible to obtain good contacts, the conduits shall be bonded around the boxes with a #6 AWG gauge conductor with ground clamps.
- C. All equipment cases, motor frames, etc. shall be completely grounded to satisfy applicable code requirements.
- D. At each building, the interior hot and cold-water piping and the interior aboveground gas piping shall be bonded to the building service equipment per C.E.C. #250.104.
- E. Do not use underground gas piping as a grounding electrode.
- F. Pull a green equipment ground conductor in all power conduits, both metallic and non-metallic.
- G. Pull a separate isolated ground wire to isolated ground receptacles, insulated green with yellow stripe, in addition to the equipment ground conductor.
- H. Isolated ground conductor shall begin at the isolated ground bus in the panel in the building served and shall not be connected to any neutral conductor or any item not isolated from the system ground. All isolated ground circuits shall have a separate neutral conductor (not used for more than one circuit). The isolated ground conductor cannot extend upstream from the building served.
- I. Each disconnect switch shall have a ground connector (lay in wire type) which shall be used for grounding the disconnect enclosure. The ground wire shall continue and be connected to the enclosure of the equipment served.
- J. Where there is more than one building supplied from a common service, provide a grounding electrode at each building per C.E.C. #250.32.
- K. At each telephone backboard and/or data backboard, provide a power distribution block (one pole with two primary openings and six secondary openings) and mount at + 18" A.F.F. unless otherwise noted. Run  $\frac{3}{4}$ "C - 1 #6 AWG to the ground bar of the nearest panel or the ground bus of the main switchboard. Power distribution block shall be Square D #LBA 163206 or equal.

### 3.7 MOUNTING HEIGHTS OF EQUIPMENT

- A. A. Unless otherwise specified elsewhere or shown on the plans, the following mounting shall apply:
  - 1. Panelboards: 6'-0" top of box
  - 2. Disconnect Switches: 4'-0" to center line
  - 3. Contactors: 4'-0" to center line

### 3.8 IDENTIFICATION OF SWITCHES AND APPARATUS

- A. All switchboard circuits, externally operated switches and apparatus used for the operation of or control of circuits, appliances, or equipment shall be properly identified with an engraved Bakelite nameplates, 1" x 3", black letters on white background. All such nameplates shall be of the self-adhesive type and attached onto the apparatus by screws or rivets. Card holders in any form are not acceptable.

### 3.9 EARTHQUAKE PROOFING OF LIGHT FIXTURES

- A. Fixtures weighing more than 50 pounds shall be supported independently of the outlet box.
- B. Pendant type fixtures shall be designed so that they may swing horizontally in any direction a minimum of 45 degrees from the vertical. Pendant shall have ball aligner at top, and swivel connection at fixture. If there is an obstruction within the 45 swing of the fixture the Contractor shall provide a State approved restraint to keep fixture from swinging into the obstruction.
- C. All fixtures mounted in or on suspended ceilings shall be fastened to the ceiling-framing members in accordance with C.E.C. #410.36(B). Recessed fixtures in t-bar ceilings shall be provided with integral t-bar clips, one near each corner to attach it to the t-bar ceiling frame.
- D. Recessed fixtures in T-bar ceilings shall be attached to the building structure above with #12 Ga. slack safety wire at two diagonal corners of each fixture (two wires per fixture).

### 3.10 FIRE RATED AREAS

- A. Where light fixtures, conduit, cabinets, or boxes penetrate fire rated ceilings, walls or floors provide a fire rated enclosure or fire stop. Rating of enclosure or fire stop shall match or exceed rating of area penetrated. Verify location of fire rated areas with architectural drawings and with General Contractor.
- B. Where outlet boxes are recessed on opposite sides of a fire rated wall, boxes shall be separated by a horizontal distance of at least 24 inches. Where the wall opening for a steel electrical outlet box exceeds 16 sq. inches in area, or an aggregate of more than 100 sq. inches for any 100 sq. feet of wall or partition area, fire stopping is required.
- C. Penetrations in walls, floors or ceilings requiring protected openings shall be fire-stopped.
- D. Fire-stopped shall be of an approved material, securely installed and be in conformance with the 2025 C.B.C, Section 714.3.
- E. All required fire-stopping and joint sealants as a result of the work in Divisions 26, 27 and 28 is the responsibility of each individual trade. Refer to Sections 07 8400 and 07 9210, respectively.

### 3.11 MISCELLANEOUS EQUIPMENT

- A. Contractor shall be responsible for electrical hook up and connections to all electrical equipment whether furnished by this Contractor or others, including wiring, conduit, disconnects, circuit breakers etc., even if not shown on drawings. Verify all locations and requirements with equipment supplier before rough-in.
- B. When there are fire sprinklers, the Electrical Contractor shall connect bell, flow and tamper switches and other electrical devices as required by Sprinkler Contractor and local and state fire marshal. Verify requirements with General Contractor before bid.

### 3.12 INTERRUPTION OF SERVICE

- A. Interruption of service in existing buildings shall not be made at a time which will inconvenience the Owner. Before making any final connections to the existing buildings or doing any other work that will interrupt the service, the Contractor shall consult with the Owner and schedule the work at Owner's convenience even if it is necessary to make such connections after regular working hours.
- B. This Contractor shall do all rerouting and reconnecting of existing electrical facilities made necessary by this construction. Care shall be taken not to disrupt existing facilities. If any facilities are disrupted, this Contractor shall replace or repair them at his expense and to the satisfaction of the Architect.

### 3.13 CHANGES

- A. Electrical Contractor shall consider the number of outlets for electric equipment shown on plans as final, but the Architect reserves the right to shift same, within reason, to a location and position which will meet more completely final requirements.

### 3.14 GUARANTEE AND TESTS

- A. All electrical equipment testing, and related costs shall be included in the Contractor's bid.
- B. Contractor shall obtain approval from the Architect of proposed independent testing agencies before any testing is started.
- C. Equipment of all kinds installed by this Contractor shall be tested to determine whether it fulfills the requirements of these specifications. The Contractor shall furnish all labor necessary to adjust the operation of the apparatus and make the connections for the tests. After the tests have been completed, the Contractor shall restore all connections, apparatus, etc., to their original condition.
- D. Should any piece of apparatus or any material or work fail in any of these tests, it shall be immediately removed and be replaced with new material by this Contractor at his expense and the portion of the work replaced be again tested by the Contractor.
- E. The entire installation shall be free from short circuits and improper grounds. Panels and circuits shall be tested for grounds and shorts. Each individual circuit shall be tested at the panel with the equipment connected for proper operation. Ground tests shall meet the requirements of the California Electrical Code. Upon completion of the work, a final inspection by the Architect and other interested authorities shall be conducted. This Contractor shall guarantee to repair or replace at his expense any material or equipment that develops defects or is determined not to be in conformance with the plans and specifications, during a period of one year after work is accepted by the Owner.

- F. All feeder cables #2 and larger shall be tested for insulation resistance. Test report must include number of cable per phase & type of cable insulation.
- G. Three copies of the test report shall be submitted to the Electrical Engineer prior to the final job walk.
- H. The independent testing agency performing the above-mentioned tests shall be NETA or NICET certified or approved by the electrical engineer.

### 3.15 DEMOLITION

- A. Remove and/or relocate electrical facilities as required to clear areas for new construction.

END OF SECTION

## SECTION 271000 - STRUCTURED CABLING

### PART 1 GENERAL

#### 1.1 RELATED REQUIREMENTS

- A. Section 267000 - Basic Electrical Material and Methods .

#### 1.2 REFERENCE STANDARDS

- A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.
- B. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2021.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2024.
- E. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2024e.
- F. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).
- G. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.
- H. TIA-607 - Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2024e.
- I. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- J. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- K. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

#### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
  - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
  - 3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

## 1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Evidence of qualifications for installer.
- C. Field Test Reports.
- D. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
  - 1. Record actual locations of outlet boxes and distribution frames.
  - 2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
  - 3. Identify distribution frames and equipment rooms by room number on drawings.
- E. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

## 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
- B. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
  - 1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
  - 2. Supervisors and installers factory certified by manufacturers of products to be installed.
- C. Products: Listed, classified, and labeled as suitable for the purpose intended.

## 1.6 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a 2 year period after Date of Substantial Completion.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESIGN

- A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
  - 1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
  - 2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
  - 3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
  - 4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
- B. System Description:

- C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
  - 1. Locate main distribution frame as indicated on the drawings.
- D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
  - 1. Locate intermediate distribution frames as indicated on the drawings.
- E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.
- F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

## 2.2 PATHWAYS

- A. Conduit: See section 267000.
- B. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

## 2.3 COPPER CABLE AND TERMINATIONS

- A. Copper Backbone Cable:
  - 1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2, ICEA S-90-661, and listed and labeled as complying with UL 444; arranged in 25-pair binder groups.
  - 2. Cable Type: TIA-568.2 Category 3 UTP (unshielded twisted pair); 24 AWG.
  - 3. Cable Capacity: Quantity of pairs as indicated on drawings.
  - 4. Cable Applications:
    - a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
    - b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
- B. Copper Horizontal Cable:
  - 1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
  - 2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
  - 3. Cable Capacity: 4-pair.
  - 4. Cable Applications:
    - a. Plenum Applications: Use listed NFPA 70 Type CMP plenum cable.
    - b. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
    - c. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.

- C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
  - 1. Performance: 500 mating cycles.
  - 2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
- E. Copper Patch Cords:
  - 1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
  - 2. Patch Cords for Patch Panels:
    - a. Quantity: One for each pair of patch panel ports.
    - b. Length: As required.

## 2.4 COMMUNICATIONS OUTLETS

- A. Outlet Boxes: Comply with Section 260533.16.
  - 1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
- B. Wall Plates:
  - 1. Comply with system design standards and UL 514C.
  - 2. Accepts modular jacks/inserts.
  - 3. Capacity:
  - 4. Wall Plate Material/Finish - Flush-Mounted Outlets: High impact thermoplastic, white.

## 2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.

## 2.6 ACCESSORIES

- A. Hook-and-Loop Cable Ties:
  - 1. Description: Single-component, self-engaging fastener with hook on one side and engageable loop backing.
  - 2. Cable Ties Installed in Spaces Used for Environmental Air: Fire retardant; plenum rated, listed as suitable for use in air-handling spaces.

## PART 3 EXECUTION

### 3.1 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

### 3.2 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
  - 1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
  - 2. 12 inches (300 mm) from power conduits and cables and panelboards.
  - 3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
  - 4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
- B. Outlet Boxes:
  - 1. Coordinate locations of outlet boxes provided under Section 267000 as required for installation of telecommunications outlets provided under this section.
    - a. Mounting Heights: Unless otherwise indicated, as follows:
      - 1) Telephone and Data Outlets: 18 inches (450 mm) above finished floor.
      - 2) Telephone Outlets for Forward-Reach Wall-Mounted Telephones: 48 inches (1.2 m) above finished floor to top of telephone.
    - b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

### 3.3 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:
  - 1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
  - 2. Do not over-cinch or crush cables.
  - 3. Do not exceed manufacturer's recommended cable pull tension.
  - 4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
  - 1. At Distribution Frames: 120 inches (3000 mm).
  - 2. At Outlets - Copper: 12 inches (305 mm).
- C. Copper Cabling:
  - 1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
  - 2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
  - 3. Use T568B wiring configuration.
- D. Identification:
  - 1. Use wire and cable markers to identify cables at each end.

2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.

### 3.4 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Comply with inspection and testing requirements of specified installation standards.
- C. Visual Inspection:
  1. Inspect cable jackets for certification markings.
  2. Inspect cable terminations for color coded labels of proper type.
  3. Inspect outlet plates and patch panels for complete labels.
- D. Testing - Copper Cabling and Associated Equipment:
  1. Test backbone cables after termination but before cross-connection.
  2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
  3. Category 3 Backbone: Perform attenuation test.
  4. Category 3 Links: Test each pair for short circuit continuity, short to ground, crosses, reversed polarity, operational and ring-back, and dial tone.
  5. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
- E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

## SECTION 284600 - FIRE DETECTION AND ALARM - NOTIFIER INSPIRE

### PART 1 GENERAL

#### 1.1 ABBREVIATIONS AND ACRONYMS

- A. A: Amps.
- B. AHJ: Authorities having jurisdiction.
- C. AV: Audio-visual.
- D. CLSS: Connected life-safety services.
- E. EVACS: Emergency voice/alarm communication systems.
- F. FACU: Fire alarm control unit.
- G. HVAC: Heating, ventilation, and air conditioning.
- H. IDC: Initiating device circuit.
- I. LAN: Local area network.
- J. NAC: Notification appliance circuit.
- K. SLC: Signaling line circuit.
- L. USB: Universal serial bus.
- M. VAC: Voltage alternating-current.
- N. VDC: Voltage direct-current.
- O. Vrms: Voltage root-mean-square.
- P. W: Watts.

#### 1.2 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. FM (AG) - FM Approval Guide; Current Edition.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.  
  
NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.  
  
NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. UL 38 - Standard for Manual Signaling Boxes for Fire Alarm Systems; Current Edition, Including All Revisions.

- E. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.
- F. UL 464 - Standard for Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.
- G. UL 521 - Standard for Heat Detectors for Fire Protective Signaling Systems; Current Edition, Including All Revisions.
- UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.
- H. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.
- I. UL 1480 - Standard for Speakers for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.
- J. UL 1481 - Power Supplies for Fire-Protective Signaling Systems; Current Edition, Including All Revisions.
- K. UL 1638 - Standard for Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories; Current Edition, Including All Revisions.
- L. UL 1711 - Amplifiers for Fire Protective Signaling Systems; Current Edition, Including All Revisions.
- M. UL 1971 - Standard for Signaling Devices for the Hearing Impaired; Current Edition, Including All Revisions.
- N. UL 2017 - General-Purpose Signaling Devices and Systems; Current Edition, Including All Revisions.
- O. UL 2610 - Commercial Premises Security Alarm Units and Systems; Current Edition, Including All Revisions.
- P. UL 60950-1 - Information Technology Equipment – Safety – Part 1: General Requirements; Current Edition, Including All Revisions.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  1. Coordinate arrangement of equipment with dimensions and clearance requirements of actual equipment to be installed.
  2. Coordinate placement of devices and notification appliances with potential conflicts and view obstructions installed under other sections or by others.
  3. Coordinate work to provide power for equipment at required locations.
  4. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

### 1.4 SUBMITTALS

- A. Include sufficient information, clearly presented, to determine compliance with specifications and drawings.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.
- C. Manufacturer's qualification statement.
- D. Manufacturer's certification that products meet or exceed specified requirements.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Inspection and Test Reports:
  - 1. Installer to submit inspection and test plan prior to closeout demonstration.
  - 2. Installer to submit NFPA 72 "Record of Inspection and Testing" forms, filled out by installer.
- G. Installer to submit NFPA 72 "Record of Completion" forms, filled out completely by installer and signed by Owner and authorized representative of AHJ.
- H. Operation and Maintenance Data:
  - 1. Include detailed information on system operation, equipment programming and setup.
  - 2. Include manufacturer's preventive maintenance recommendations.
  - 3. Other data as defined in NFPA 72 chapter "Inspection, Testing, and Maintenance."
- I. Executed Warranty: Submit documentation of final executed product warranties completed in Owner's name and registered with manufacturer.
- J. Project Record Documents:
  - 1. Installer to record actual locations of system components and installed wiring arrangements and routing. Indicate final devices, notification appliances, and terminal identifications.
- K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Spot-Type Detectors: Five percent of total quantity installed for each type, but not less than one of each type supplied.
  - 2. Extra Notification Appliances: Five percent of total quantity installed for each type, but not less than one of each type supplied.
  - 3. Extra Fuses: Two of each size and type; store inside applicable control cabinet.

## 1.5 QUALITY ASSURANCE

- A. Comply with the following:
  - 1. Requirements of AHJ.
  - 2. Applicable local codes.
  - 3. ADA Standards.
  - 4. NFPA 70 (National Electrical Code).
  - 5. NFPA 72 (National Fire Alarm and Signaling Code).

- B. Equipment, Programming, and Installation Supervision:
  - 1. Provide services of approved engineered systems distributor of Honeywell Notifier for equipment, programming, and installation supervision.
- C. Installer Qualifications:
  - 1. Company with minimum three years documented experience with similar fire alarm systems and providing contract maintenance service as regular part of their business.
  - 2. Familiar with products to be installed through documented manufacturer training, authorization, or equivalent demonstrated experience.
    - a. Notifier Basis of Design System: Specialized training as provided by Notifier Premier representative.
  - 3. Installer Personnel: At least three years experience installing fire alarm systems.
  - 4. Supervisor: State licensed and NICET Level III certified fire alarm technician.
  - 5. Licensed electrical or systems contractor in the State in which the Project is located.
- D. Product Evaluation and Listing Organization Qualifications: Organization engaged in evaluation of products and services, including those recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL), and acceptable to AHJ.

## 1.6 WARRANTY

- A. Provide minimum three year manufacturer warranty for FACU and accessory equipment covering repair or replacement due to defective materials or workmanship.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Fire Alarm Control Unit and Accessory Equipment - Basis of Design: Notifier INSPIRE Series by Honeywell; [www.securityandfire.honeywell.com/notifier/en-us/browseallcategories/control-panel/notifier-inspire-series/#sle](http://www.securityandfire.honeywell.com/notifier/en-us/browseallcategories/control-panel/notifier-inspire-series/#sle).
- B. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with necessary modifications to related work, including design fees.
- C. Source Limitations: Where possible, furnish system components and accessories produced by one manufacturer and obtained from one supplier.

### 2.2 FIRE ALARM SYSTEM

- A. Provide modifications and extensions to existing fire alarm system consisting of required components (e.g., equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, and system programming) as necessary for complete operating system that provides functional intent indicated.
- B. Products: Listed, classified, and labeled as suitable for purpose intended.

C. Power Sources:

1. Primary: Dedicated branch circuits from facility power distribution system.
2. Secondary: Storage batteries with capacity to operate system for period specified by NFPA 72.

D. Exterior Notification: In addition to required occupant notification, provide notification appliances on exterior of building.

E. General Wiring Methods:

1. Pathway class designations and pathway survivability are as defined in NFPA 72.
2. Pathway Class Designations:
  - a. Unless otherwise indicated or required, pathways to meet the following requirements:
    - 1) SLCs: Class B.
    - 2) IDCs: Class B.
    - 3) NACs: Class B.
    - 4) Network Communications: Class B.
3. Pathway Survivability:
  - a. Unless otherwise indicated or required, pathways to meet requirements for Pathway Survivability Level 0.

F. Fire Alarm System Interfaces:

1. UL 864 listed unless otherwise indicated.
2. Descriptions below are intended to provide means for interface. See project sequence of operations, narrative, and input/output matrix for execution requirements.
3. Provide addressable monitor modules as indicated or as required for connection to addressable FACU. Unless devices are explicitly permitted to be connected together as one zone, provide separate addressable monitoring points for each device to be individually identifiable by addressable FACU.
4. Provide addressable relay module as indicated or as required to perform necessary functions via dry-contact interface. Where load exceeds module contact rating, provide accessory power isolation relays suitable for load as required.

## 2.3 FIRE ALARM CONTROL UNIT AND RELATED EQUIPMENT

A. Provide system listed and labeled as complying with agency listings and approval requirements as follows:

1. UL 864 (Control Units and Accessories for Fire Alarm Systems).
2. UL 2017 (General-Purpose Signaling Devices and Systems).
3. UL 2610 (Commercial Premises Security Alarm Units and Systems).
4. FM (AG) (FM approved).
5. California State Fire Marshall (CSFM).

B. Provide cabinets and enclosures as indicated or as required to house system components.

C. Fire Alarm Control Unit (FACU): EXISTING

1. SLCs:
  - a. Expandable enclosure, up to ten SLCs.
    - 1) Supporting up to 3180 devices (1590 detectors and 1590 modules) configurable for Class B or Class A with signaling loop modules.
    - 2) Configured with with voice and networking capability.
2. FACU User-Interface:
  - a. Provide high-definition 10-inch (254 mm) 1024 X 600 color touchscreen display.
  - b. Include audible and visible feedback with adjustable brightness solid-state LCD.
  - c. Include graphical QWERTY-style keypad on color, touchscreen display when alphanumeric input is required.
  - d. Provide capability to scroll events by type using touchscreen (e.g., fire alarm, supervisory alarm, and trouble).
  - e. Permit uploading of custom background image.
  - f. Include ability to display up to 3,000 events in order of priority and time of occurrence.
  - g. Provide event counters to indicate total number of events by type.
  - h. Passwords and Users:
    - 1) Support five access levels (e.g., system operator, building maintenance user, technician user, admin user, master user) and up to 50 usernames and passwords.
    - 2) Each role level access has default customizable permissions.
    - 3) Only master password allows password change.
  - i. Custom Actions:
    - 1) Messages: Provide means of entering up to 100 custom action messages, up to 160 characters each, with ability to assign any of 100 messages to any point.
    - 2) Button: Support up to 32 programmable custom action buttons on LCD touchscreen display used to enable/disable or control outputs without use of additional hardware.
  - j. Support up to ten remote LCD displays. See "Remote LCD Display" below.
  - k. Support display of events, from up to two additional nodes, without additional hardware or licensing.
  - l. Capable of displaying of all network events if configured as network control display, without additional hardware.
3. Provide FACU based on licensing model to allow for future expansion.
  - a. Support licensable features to expand logical operations and features for FACU and display functionality.
  - b. Support SLC expansion from one up to ten, using same FACU central processing unit and without need to be replaced or upgraded.
4. Online, Offline, or Remote Programming:
  - a. Provide means to program panel either through offline software utility program nonlocal to panel or connected online remotely via secured gateway.

- b. Support upload/download of programmed database to personal computer (PC) or cloud storage.
- 5. History Events:
  - a. Support software maintained history file for last 10,000 events; each with time and date stamp with ability to scroll through stored events.
  - b. Include alarms, troubles, operator actions, and programming entries.
  - c. Provide ability to filter and sort history by event type, date, or point range.
- 6. Service Mode:
  - a. Provide ability to remotely access FACU for programming, testing, and control.
  - b. Include customizable time-out feature.
  - c. Trouble condition is displayed while in this mode.
- 7. Support AV magnet test with compatible AV appliances. Provide ability to test individual AV appliances on NAC by applying magnet to appliance momentarily; test does not activate entire circuit, minimizing disruptions during testing and inspection.
- 8. Support self-testing detector capability.
- 9. Logical Operators:
  - a. Support logical functions, including at minimum: AND (ALL), OR (ANY), NOT, ONLY1, COUNT (one-nine), and TIMERS.
  - b. Inputs for Operators: Time of day, addressable devices, software points, and trouble codes.
  - c. Capable of differentiating operator inputs by specific device status (i.e., fire alarm, prealarm, nonalarm, disable, supervisory, and security).
- 10. Support up to 80 addressable panel annunciators. See "Addressable Panel Annunciators" below.
- 11. FACU Main Power Supply:
  - a. Provide addressable main power supply with universal input to accept either 120/240 VAC, 60 Hz, supplying all necessary power for FACU.
  - b. Include minimum four integral and programmable NACs.
    - 1) Provide onboard patterns, zone coding, and synchronization (System Sensor, Wheelock, and Gentex).
  - c. Supply power distribution of each addressable main power supply that can be customizable to provide power for system, NAC, supporting circuits, auxiliary, and battery charging.
  - d. Up to three addressable main power supplies may be added within one FACU to expand power capacity.
  - e. Power supply supports up to 210 AH batteries.
- 12. Provide modular dress-panel and door design with interchangeable hinge locations.
  - a. Provide doors capable of reversible (left or right) hinge and lock.
  - b. Provide doors with interchangeable grey trim.

13. Basis of Design Products:

- a. Notifier INSPIRE Series Model CPU-N16LD (N16x) expandable to 10 SLCs with 10-inch (254 mm) touchscreen display, and power supply with four NACs premounted on chassis compatible with CAB-5 enclosure.
- b. Notifier CAB-5 Series enclosure with door for mounting; include required dress plates and finish trims.
- c. Notifier Model SLM-318; signal loop module.

D. Emergency Voice/Alarm Communications System (EVACS) Panel:

- 1. Provide system listed and labeled as complying with UL 864.
  - a. Provide the following additional agency listings and approval requirements:
    - 1) UL 464 (Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories).
    - 2) UL 1481 (Power Supplies for Fire-Protective Signaling Systems).
    - 3) UL 1638 (Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories).
    - 4) UL 1711 (Amplifiers for Fire Protective Signaling Systems).
    - 5) UL 1971 (Signaling Devices for the Deaf and Hard of Hearing).
    - 6) UL 60950-1 (Information Technology Equipment - Part 1: General Requirements).
- 2. Provide digital voice command center located with FACU and containing equipment required for audio control, signaling and supervisory functions. This includes speaker zone indication and control, EVACS controller, and master microphone
- 3. Provide EVACS Controller which is field programmable without requiring return of components to manufacturer and without requiring use of external computers or other programming equipment.
  - a. Capable of supporting up to eight channels of simultaneous audio; each identified evacuation zone to allow broadcast of automatic audio or manual paging independent of other evacuation zones.
  - b. Provide factory recorded "library" of voice messages and tones in standard .WAV file format, which may be edited and saved on PCs running current Windows operating system.
  - c. Capable of control and supervision of 32 distributed digital amplifiers or 16 bulk digital distribution boards.
  - d. Provide communication channel which allows connection to digital amplifiers via manufacturer-approved copper wire media. Communications loop to be considered part of fire alarm system network and meet specified requirements for wiring methods and pathway survivability.
  - e. Include auxiliary input for external 1 Vrms audio source (e.g., music, and paging), configurable to mute during emergency events and power loss.
- 4. Provide switch points of command as follows, unless otherwise approved by Engineer and AHJ:
  - a. All-Call: Provides manual paging for all zones simultaneously.
  - b. Total Evacuation: Provides complete building-wide activation of audio and visual evacuation signals; restore on switch deactivation, signal silence, or system reset command.

- c. Provide minimum of two switch points of manual controls per evacuation zone for manual paging and/or manual evacuation.
    - 1) Manual Evacuation: Activate audio and visual evacuation signals on selected zone. Restore on switch deactivation, signal silence, or system reset command.
    - 2) Manual Paging: Where active evacuation zone is selected, pause evacuation signal for manual page. Resume evacuation signal upon completion of paging function unless silence or reset command has been initiated.
  - d. In addition to required emergency messaging, provide switch points of command for minimum of three prerecorded messages for nonemergency all-call notifications including "event has cleared", "testing of system", and "clear from testing of system".
  - e. Provide minimum of six switch points of command for speaker bypass, visual bypass, elevator recall bypass, door control bypass, HVAC bypass, and auxiliary bypass.
5. Audio Transponders:
- a. Audio hardware, including amplifiers, speaker circuit interfaces, power supplies, supervision hardware, cabinets, and battery backup systems may be configured to support multiple notification zones and packaged as audio transponders.
  - b. Transponders to be considered system control equipment and located, installed, and interfaced accordingly.
  - c. Components mounted in transponders to be listed and approved for installed configuration.
  - d. Provide maximum speaker circuit lengths with minimum signal loss for both current scope and future expansion consideration; maximum signal loss of minus 3 dB per speaker circuit, utilizing 70 Vrms audio for speaker circuits.
6. Distributed Digital Audio Amplifiers:
- a. Interface with EVACS controller via individual address to allow for dedicated communication of audio, activation, and fault status.
  - b. Provide minimum quantity of two integrated speaker circuits per amplifier, each with unique system sub-address to allow for individual activation, control, and fault supervision. Systems that utilize addressable control or relay modules to provide speaker circuits are not permitted.
  - c. Provide capability to charge or supervise batteries and allow for inherent ground fault detection.
  - d. Provide capability for local mode alarm trigger for local activation and broadcast of evacuation tone on integrated speaker circuits in event of communication loss with system control hardware.
  - e. Include auxiliary input for external 1 Vrms audio source (e.g., music, and paging), configurable to mute during emergency events and power loss.
  - f. Provide capability to communicate detailed status of faults and conditions affecting operation of amplifiers and individual circuits. Systems that combine audio and communication into single points via addressable modules or other hardware are not permitted.
7. Basis of Design Products:
- a. Notifier Model DVC-EM; digital multi-channel voice evacuation (EVACS) system integrated with FACU.
    - 1) Notifier Model DVC-KDB; voice control keypad for DVC-EM with status indicators and 24 user-programmable buttons.

b. Distributed Digital Audio Amplifiers:

- 1) Notifier Model DAA2-5070; 50 W, 70 Vrms amplifier with four Class B or two Class A speaker circuits

E. High-Speed Networking:

1. LAN network architecture; peer-to-peer based firmware package, inherently regenerative communication format and protocol.
2. Support of up to 200 network nodes Class B or Class X operation with data communications rate of 12 Mbps (wire) or 100 Mbps (fiber).
3. Support high-speed network communications cards including ability to use combination wire/fiber communications using internal conversion cards without external converters.
4. Networks with Copper Media:
  - a. Support up to 3,000 feet (914.4 m) of 18 AWG to 12 AWG, twisted-pair cable per segment following manufacturer's documented guidelines.
  - b. Provide surge protection for wiring that leaves building structures.
5. Provide network capable of single channel digital voice and firefighters telephone, as well as panel-to-panel (same network media; wire and/or fiber) communications.
6. Basis of Design Products:
  - a. High-Speed Networks with Copper Media: Notifier Model HS-NCM-W-2 high-speed network communications module, twisted-pair copper wire interface.
  - b. High-Speed Networks with Mixed Medias:

F. Alarm Transmission and Integration: EXISTING

1. Integrated Gateway:
  - a. California State Fire Marshal (CSFM) listed.
  - b. FCC compliant.
  - c. Provide gateway for connection to fire system panel or panel network, serving as interface between FACU, supervising/central station, cloud services and peripheral devices.
  - d. Able to read connected device system database for individual FACU or network of panels and automated report creation for supervising/central station.
  - e. Reduce transfer times to supervising/central stations, dispatch centers, and emergency responders by eliminating need for additional transmission equipment (e.g., alarm-capture devices, and dialers) and associated processing delays while increasing reliability and accuracy of alarm transmission.
  - f. Enable detailed context sharing directly with first responders upon fire event to improve emergency response efficiency.
  - g. Capable of alarm transmission over AT&T or Verizon cellular networks. Selection of which cellular network will be user configured using communication modules selected based on strongest cellular signal available at location.
  - h. Capable of alarm transmission over Ethernet or Wi-Fi networks.
  - i. Enable integration directly to private radio communicator via Ethernet connection
  - j. Enable supplementary transmission of real-time data from fire alarm system to cloud service to enable remote monitoring of events via web application or mobile device application.
  - k. Support IP-based gateway to enable fire alarm panel or network of panels to be connected to PC-based graphical monitoring workstation via Internet or LAN.
  - l. Provide lockable plastic cabinet which is keyed identical to FACU.

2. Basis of Design Products:

- a. Integrated Gateway; Honeywell Model HON-CGW-MBB (CLSS gateway with enclosure) with Model 50160636-001 (keylock and cable kit) with support for monitoring via any supervising/central station.
  - 1) Integrated Gateway Cellular Modules: CCM-ATT-HON; AT&T cellular communication module or CCM-VZ-HON; Verizon cellular communication module.

G. Addressable Panel Annunciators:

- 1. Comply with UL 864.
- 2. Provide plug-in terminal blocks for wiring connections.
- 3. Buttons and indicators capable of custom programming up to 60 points of annunciation.
- 4. Provide trichromatic LEDs (RGB) for custom colors as follows: red, green, yellow, white, amber, blue, cyan, or purple.
- 5. Include 30 pushbuttons with two corresponding LEDs each.
- 6. Each pushbutton and LED can be programmed independently for different points or grouped with other indicators for cooperative operation.
- 7. Provide reindication of alarm or trouble by resounding and flashing when new conditions occur.
- 8. Provide local sounder for alarm and trouble conditions; include programming option to silence/acknowledge by pushbutton.
- 9. Capable of speaker control mode with integrated voice and FACU, allowing remote control for groups of multi-channels mapped to groups of multi-speakers.
- 10. Basis of Design Products:
  - a. Notifier Model ACM-30 fully customizable annunciator; independently configured buttons; up to 60 points; programmable LEDs.
    - 1) Notifier Model CAB-4 or CAB-5 dress panel or compatible backbox for mounting.

H. Remote LCD Display:

- 1. Comply with UL 864.
- 2. Capable of mimicking display of either FACU or network control display, based on connection or only information per specific zones.
- 3. Provide plug-in terminal blocks for wiring connections.
- 4. Provide 5-inch (127 mm) capacitive full color touchscreen LCD annunciator that displays all system events.
- 5. Block Acknowledge: Support block acknowledge for trouble and disable conditions.
- 6. Provide programmer key switch for user authentication, providing ability to enable control inputs for acknowledge, silence, reset, and drill.
- 7. Provide configurable control buttons that are operational only when keyswitch is unlocked.
- 8. Provide six programmable buttons, each with descriptor/label, status indicator and configurable action (on/off, disable/enable).
- 9. Capable of being field programmed using PC configuration software.
  - a. Provide standard USB-C connection for software interface.

10. Basis of Design Products:

- a. Notifier Model RLD network control annunciator, 5-inch (127 mm) color touch screen display; mounts in standard 3-gang backbox.

I. Notification Appliance Circuit (NAC) Expansion:

- 1. Comply with UL 864.
- 2. Where NAC requirements exceed capacity of FACU, provide accessories as required for expansion.
- 3. Cabinet-mounted with capacity for providing 6 A 24 VDC notification appliance power and 5 Class B NAC outputs.
  - a. Include self-contained, lockable cabinet capable of storing 7 or 18 AH batteries.
  - b. Battery charger capacity capable of charging 7 AH to 33 AH sealed lead acid batteries.
  - c. Provide two activation inputs which allow for synchronization pass-through and can be associated with any combination of NAC outputs.
- 4. Where Class A NACs are required, provide Class A module to enable each NAC to be configured as Class A.
- 5. Provide integral synchronization of both audio and visual circuits to match protocol assigned by FACU.
- 6. Basis of Design Products:
  - a. Honeywell Model HPF-PS6; 6 A notification power expander with five 24 VDC individually configurable outputs, red metal enclosure.
    - 1) ZNAC-PS Class A output converter module.

2.4 FIRE ALARM SYSTEM INITIATING DEVICES

A. General Requirements:

- 1. Addressable Devices: Individually identifiable by addressable FACU; suitable for connection to FACU SLCs. Provide address-setting means on device using rotary switches with simple numerical indicators. Devices which require proprietary tools or dip switches to address device will not be accepted.
- 2. Conventional (Nonaddressable) Devices: Provide addressable monitor modules or two-wire detector zone modules (See "Addressable Interface Modules" article for Basis of Design Products) as indicated or as required for connection to addressable FACU. Unless devices are explicitly permitted to be connected together as one zone, provide separate addressable monitoring point for each device in order to be individually identifiable by addressable FACU.
- 3. Provide devices and associated accessories suitable for intended application and location to be installed. Unless otherwise indicated, use addressable devices and addressable monitor modules only in clean, dry, indoor, nonhazardous locations.
- 4. Surface-Mounted Devices: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.
- 5. Devices for Outdoor and Damp/Wet Locations: Weatherproof, suitable for outdoor use; provide manufacturer's accessory backboxes and enclosures in accordance with product listing.

6. Devices for Hazardous (Classified) Locations: Listed and labeled as suitable for classification of installed location.

B. Manual Fire Alarm Boxes (Pull Stations):

1. Description: Noncoded manual signaling boxes listed and labeled as complying with UL 38.
2. Alarm Initiation: Configured for general alarm initiation unless otherwise indicated; presignal stations (where indicated) require use of key to initiate general alarm.
3. Operation: Dual-action unless otherwise indicated; first requires pushing in then pulling down of lever.
4. Color: Red, in accordance with NFPA 72.
5. Station Reset: Requires use of key or tool.
6. Basis of Design Products:
  - a. Manual Pull Stations:
    - 1) Notifier Model NBG-12LX addressable manual pull station, indoor rated, dual-action, key lock.
  - b. Surface Mount Backboxes:
    - 1) Notifier Model SB-I/O surface mount backbox for indoor or outdoor wall-mounted manual pull station, plastic.

C. Spot-Type Detectors:

1. Addressable Detectors:
  - a. Comply with "General Requirements for Addressable Devices."
  - b. Provide LED indication of normal operation/regular communication with FACU condition.
  - c. Furnished with output for remote LED alarm indicator.
  - d. Utilizes plug-in mounting to separate base with tamper-resistant feature; compatible with available sounder, relay, and isolator bases; provide base as indicated or as required.
2. Smoke Detectors:
  - a. Listed and labeled as complying with UL 268.
  - b. Use photoelectric (light-scattering) principal to measure smoke density.
  - c. Provide data to FACU representing analog level of smoke density.
3. Thermal (Heat) Detectors:
  - a. Listed and labeled as complying with UL 521.
  - b. Provide fixed thermal sensor which activates at 135 degrees F (57 degrees C).
4. Detector/Base Color: White, unless otherwise indicated.
5. Basis of Design Products:
  - a. Smoke Detectors:

- 1) Notifier Model FSP-951 addressable smoke detector, indoor rated, photoelectric, integral drift compensation, self-diagnostics, transient rejection, local test via application of external magnet.
- b. Thermal (Heat) Detectors:
  - 1) Notifier Model FST-951H addressable thermal detector, indoor rated, fixed temperature, 190 degrees F (88 degrees C), RTI rating of QUICK or better, local test via application of external magnet.
- c. Bases for Addressable Detectors:
  - 1) WIRELESS DETECTOR BASES----->

## 2.5 FIRE ALARM SYSTEM INTERFACE MODULES

- A. Fire alarm system accessory equipment listed and labeled as complying with UL 864.
- B. Provide addressable interface modules as indicated or required for fire alarm and nonfire alarm interfaced systems.
- C. Individually identifiable by addressable FACU; suitable for connection to FACU SLCs. Provide address-setting means on device using rotary switches with simple numerical indicators. Devices which require proprietary tools or dip switches to address device will not be accepted.
- D. Provide addressable modules suitable for connection to FACU SLCs.
- E. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.
- F. Addressable Monitor Modules: Unless devices are explicitly permitted to be connected together as one zone, provide separate addressable monitor module for each conventional dry-contact input device in order to be individually identifiable by addressable FACU.
- G. Addressable Control Modules: Provide as indicated or as required for selective control of notification appliances.
- H. Addressable Relay Modules: Provide as indicated or as required to perform necessary functions via dry-contact interface. Where load exceeds module contact rating, provide accessory power isolation relays suitable for load as required.
- I. Addressable Signaling Line Circuit (SLC) Isolating Modules: Provide as indicated or as required to automatically isolate short circuits on connected sections of SLC loops and allow other sections to continue to function normally. Provide automatic reset upon correction of short circuit.
- J. Basis of Design Products:
  1. Addressable Monitor Modules:
    - a. Notifier Model FMM-1 addressable monitor module; single monitoring point, supervises one Class A or Class B circuit of conventional dry-contact input devices; uses single module address on SLC; mounts to nominal 4-inch (102 mm) square or 2-gang box, includes white finish cover.

2. Addressable Control Modules:
  - a. Notifier Model FCM-1 addressable control module; single supervised control output, Class A or Class B, suitable for controlling 24 VDC NAC and speakers up to 70.7 Vrms; requires separate power; uses single module address on SLC; mounts to nominal 4-inch (102 mm) square or 2-gang box, includes white finish cover.
3. Addressable Relay Modules:
  - a. Notifier Model FRM-1 addressable relay module; two Form C dry contacts that switch together; uses single module address on SLC; mounts to nominal 4-inch (102 mm) square or 2-gang box, includes white finish cover.
4. Addressable Signaling Line Circuit (SLC) Isolating Modules:
  - a. Notifier Model ISO-X addressable signaling loop circuit (SLC) isolating module; does not use any module addresses on SLC; mounts to nominal 4-inch (102 mm) square or 2-gang box, includes white finish cover.

## 2.6 FIRE ALARM SYSTEM NOTIFICATION APPLIANCES

### A. Notification Appliances - General Requirements:

1. Provide signaling devices listed for fire-protective service and intended operating mode (public or private); suitable for connection to FACU notification NAC.
2. Provide addressable control modules as indicated or as required for selective control of notification appliances.
3. Provide notification appliances and associated accessories suitable for intended application and location to be installed. Use notification appliances only according to listed mounting (i.e., ceiling or wall mounted).
4. Surface-Mounted Notification Appliances: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.
5. Notification Appliances for Outdoor and Damp/Wet Locations: Weatherproof, suitable for outdoor use; provide manufacturer's accessory backboxes and enclosures in accordance with product listing.
6. Notification Appliance Derating: Account for device derating adjustments in accordance with listing where applicable, including but not limited to the following.
  - a. Where accessory protective guards, and enclosures are utilized.
  - b. Where required by field conditions (e.g., ambient temperature).
7. Notification Appliances Colors:
  - a. See mounting configuration indicated by floor plan drawing symbols.
  - b. Wall-Mounted: Red.
  - c. Ceiling-Mounted: White.

### B. Visible Notification Appliances:

1. Public Mode Operation: Listed and labeled as complying with UL 1971.
2. Strobes: Clear or nominal white lens with flash rate of 1 Hz unless otherwise indicated or required; xenon light source with maximum pulse duration of 0.2 seconds; candela rating as indicated.

C. Audible Notification Appliances:

1. Listed and labeled as complying with UL 464.
2. Rated Sound Pressure Level: As required to achieve design sound pressure levels, but not less than 75 dB(A) at 10 feet (3.1 m) for public mode operation or 45 dB(A) at 10 feet (3.1 m) for private mode operation in accordance with UL 464.

D. Speakers for Emergency Voice/Alarm Communications Systems (EVACS):

1. Listed and labeled as complying with UL 1480.
2. Rated Sound Pressure Level: As required to achieve design sound pressure levels, but not less than 75 dB(A) at 10 feet (3.1 m) in accordance with UL 1480.
3. Frequency Range: 400 to 4,000 Hz minimum in accordance with UL 1480; listed for producing 520 Hz low frequency alarm signal for sleeping areas in accordance with NFPA 72.
4. Speaker Voltage: Field-selectable (25 Vrms, 70.7 Vrms); matched to audio distribution circuit.
5. Furnished with minimum of four field-selectable power taps.

E. Combination Notification Appliances: Comply with respective requirements for each signaling method.

F. Exterior Notification:

G. Basis of Design Products:

1. Strobes:
  - a. Notifier Model SRLED strobe (OR SYSTEM SENSOR EQUIVALENT), indoor rated, wall-mounted, red, selectable candela output (15, 30, 75, 95, 110, 135, 185 at 24 VDC nominal).
  - b. Notifier Model SCWLED strobe (OR SYSTEM SENSOR EQUIVALENT), indoor rated, ceiling-mounted, white, selectable candela output (15, 30, 75, 95, 115, 150, 177 at 24 VDC nominal).
2. Horns:
  - a. Notifier Model HGRKL horn (OR SYSTEM SENSOR EQUIVALENT), weatherproof (includes backbox), wall-mounted, red.
3. Speakers:
  - a. Notifier Model SPRK speaker (OR SYSTEM SENSOR EQUIVALENT), weatherproof (includes backbox), wall-mounted, red.
4. Speaker/Strobes:
  - a. Notifier Model SPSCWL speaker/strobe (OR SYSTEM SENSOR EQUIVALENT), indoor rated, ceiling-mounted, white, selectable candela output (15, 30, 75, 95, 115, 150, 177 at 24 VDC nominal).

## 2.7 FIRE ALARM SYSTEM ACCESSORIES

A. Cables for Network Connections:

1. Comply with manufacturer's minimum requirements.
- B. Fire Alarm System Documents and Software Cabinet:
1. Provide fire alarm document (FAD) cabinet with size as indicated or as required.
  2. Cabinet: Steel with red finish; permanently identified with text "FIRE ALARM SYSTEM DOCUMENTS"; keyed to match fire alarm system equipment; include fixed integral minimum 2 GB flash drive for electronic storage of system documents and system database program
- C. Terminal Cabinets:
1. Provide terminal cabinets with quantity of termination points as indicated or as required for application.
  2. Cabinet: Steel, with red finish; permanently identified with text "FIRE ALARM TERMINAL CABINET"; keyed to match fire alarm system equipment.
  3. Terminal Strips: Rated for 20 A at 250 VAC; terminal points rated for 12 AWG conductors.
- D. Surge Protection:
1. Line Voltage Surge Protection: UL 1449 listed; provide for each line voltage circuit that supplies operating power for fire alarm system control equipment (e.g., FACU, field booster panels, nodes, and transponders).

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that characteristics of system components are consistent with indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that circuit wiring installation is completed, tested, and ready for connection to system where applicable per conductor requirements of NFPA 72 tables located in chapter "Inspection, Testing, and Maintenance."
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with NFPA 72, NFPA 70, state and local codes, manufacturer's instructions, and as indicate on drawings.
- B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).
- C. Provide grounding and bonding in accordance with manufacturer's recommendations; see Section 260526.
- D. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

- E. Identify system wiring, components, and overcurrent protective devices for branch circuits serving fire alarm system; see Section 260553.
- F. Conceal conduit, junction boxes, and conduit supports and hangers in finished areas. Conceal or expose conduit, junction boxes, and conduit supports and hangers in unfinished areas; maintain code required access.
- G. Do not install smoke detectors before system programming and test period. If construction is ongoing during this period, take measures to protect smoke detectors from contamination and physical damage.
- H. Mount fire detection and alarm system devices, control panels, and remote annunciators flush or surface as indicated.
- I. Ensure installation locations of devices and notification appliances are in accordance with local codes, standards, and ensure manual stations are suitable for surface mounting or semi-flush mounting as indicated on drawings. Install not less than 42-inches (1.07 m), nor more than 48-inches (1.22 m), above finished floor measured to operating handle.

### 3.3 FIELD QUALITY CONTROL

- A. Notify Owner and Engineer at least two weeks prior to scheduled inspections and tests.
- B. Notify AHJ and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide equipment, tools, supplies, two-way radios, and personnel required to accomplish inspection and testing.
- D. Prepare and start system in accordance with manufacturer's instructions.
- E. Program system parameters according to project requirements.
- F. Perform initial and acceptance inspection and testing in accordance with NFPA 72 and requirements of AHJ; document each inspection and test.
- G. Test for proper interface with other systems.
- H. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

### 3.4 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### 3.5 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of system to Owner and correct deficiencies or make adjustments as directed.
  - 1. Be prepared to conduct required tests.
  - 2. Have at least one copy of operation and maintenance data, copy of project record drawings, input/output matrix, and operator instructions available during demonstration.
  - 3. Have manufacturer's authorized representative present during demonstration.

4. Demonstration may be combined with inspection and testing required by AHJ.
- B. Training: Owner Personnel Instruction:
1. Provide the following instruction to designated Owner personnel:
    - a. Hands-On Instruction: On-site, using operational system.
  2. Basic Operation: One 1-hour session pre-closeout for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on.
  3. Furnish services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

END OF SECTION

## SECTION 321216 - ASPHALTIC CONCRETE PAVING

### PART 1 - GENERAL

#### 1.01 SUMMARY

##### A. Section Includes

1. Asphaltic concrete paving and surface sealer.
2. Sub-base preparation.
3. Aggregate base course.
4. Concrete parking bumpers.
5. Asphalt speed bumps.
6. Plastic parking bumpers and speed bumps.
7. Slurry sealing.
8. Patching and repair of asphaltic concrete paving.

#### 1.02 REFERENCE STANDARDS

##### A. Conform to current adopted reference standards by date of issue of the current code cycle and the date of the Contract Documents.

##### B. ASTM - American Society for Testing and Materials

1. ASTM D977 - Standard Specification for Emulsified Asphalt
2. ASTM D1557 - Laboratory Compaction Characteristics of Soil Using Modified Effort.
3. ASTM D2026 - Standard Specification for Cutback Asphalt
4. ASTM D3910 - Design, Testing, and Construction of Slurry Seal

##### C. AASHTO - American Association of State Highways and Transportation Officials

1. AASHTO MP 1 - Performance Graded Asphalt Binders

##### D. CSS - Caltrans Standard Specifications

##### E. ISSA - International Slurry Seal Association

1. ISSA A105 - Recommended Performance Guidelines for Emulsified Asphalt Slurry Seal

##### G. SSPWC - Standard Specifications for Public Works Construction

#### 1.03 QUALITY ASSURANCE

##### A. Perform Work in accordance with CSS Section 39.

##### B. Obtain materials from same source throughout, using batch plant method for proportioning and mixing.

#### 1.04 SUBMITTALS

##### A. Product data, mix design per Section 01 30 00, Administrative Requirements.

##### B. Special Environmental Requirements Form, found in Appendix A of Section 01 35 43 Special Environmental Requirements. Provide the following information for aggregate for base course.

1. Recycled Content.

2. Local/Regional Materials.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when base surface temperature is less than 50 degrees F or surface is wet or frozen,
- B. Conformation to AQMD, Local Regulations.

1.06 SOILS INFORMATION

- A. Geotechnical Investigation has been prepared under direction of Owner. Investigation is hereby referenced as information for Work of this Section. Architect assumes no responsibility for conclusions Contractor may draw from information provided. The contractor must obtain approval for any and all deviations from the Contract Documents. Copy of investigation is available at Owner's office.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Acceptance at site.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Asphalt Binder: Performance Grade 64-10.
- B. Asphalt Aggregate: CSS Section 39, but no RAP.
- C. Class 2 Aggregate Base as defined in Section 26, CSS.

2.02 ACCESSORIES

- B. Tack Coat: ASTM D977, slow setting emulsified asphalt SS-1H.
- C. Seal Coat: Conform to Section 203-9, SSPWC.
  - 1. GUARDTOP by Industrial Asphalt/Vulcan Material Co., Inc., Irwindale, CA.
  - 2. SATIN SEAL by Blue Diamond Co., Long Beach, CA.
  - 3. Or equal, as approved in accordance with Division 01, General Requirements for Substitutions.
- D. Parking Bumpers:
  - 1. Precast concrete type, steel reinforced, air-entrained, 5000 psi, bars No. 3 minimum size. Bars shall extend to within 1-1/2 inches of ends of bumpers. Minimum bumper size: 6-inches high, 8-inches wide, 6-feet long unless otherwise indicated on Drawings. Provide chamfered corners, traverse drainage slots on underside, and a minimum of two factory-formed vertical holes through wheel stop for anchoring to substrate.
- F. Soil Sterilizer: Spike 80DF. Non-selective weed and grass killer, by Dow-Agro Sciences, Indianapolis, IN, EPA Reg. No. 62719-107, or equal, as approved in accordance with Division 01, General Requirements for Substitutions.
  - 1. Active Ingredients:

- a. Tebuthiuron: 80%
- b. Inert Ingredients: 20%
- c. Total: 100%

- G. Headers: Foundation grade redwood, minimum 2- x 4-inches. Stakes shall be minimum 2- x 3-inches in accordance with Section 302-5.5 SSPWC.

## 2.03 ASPHALT PAVING MIX

- A. Use dry material to avoid foaming. Mix Uniformly.
- B. Mix: Surface Course; Section 203-6.4 SSPWC, 1/2-inch maximum aggregate size, medium gradation curve, as required by outside temperatures at time of laying.
  - 1. Single Course: C2 (Dense Medium) aggregate. Performance Grade 64-10 asphalt.
    - a. Areas where hand spreading is required: Use 3/8-inch mix.
    - b. Playground Areas: "Playground Mix", 3/8-inch mix D2 (Dense Fine), SSPWC Table 203-6.4.4.]
- C. Mix: Section 203-6.4 SSPWC, 3/4-inch asphalt base course, 1/2-inch asphalt surface course aggregate size.
  - 1. Asphalt Base Course: B (Dense Medium Course), Performance Grade 64-10 asphalt. Thickness of 2-1/2 inches.
  - 2. Asphalt Surface Course: C2 (Dense Medium), Performance Grade 64-10 asphalt. Thickness of 1-1/2 inches.
- D. Recycled Asphalt Concrete (RAC), C2-PG 64-10 RAC and Reclaimed Asphalt Pavement (RAP) not allowed for on-site pavement.
- E. Slurry Mix Design: ISSA Type II
  - 1. Type I: Maximum nominal size aggregate; 2.36 mm (No. 8). Application rate: 8 - 12 lbs/sq.yd. Residual Asphalt Content: 10 - 16%.
  - 2. Type II: Maximum nominal size aggregate; 4.75 mm (No. 4). Application rate: 12 - 20 lbs/sq.yd. Residual Asphalt Content: 7.5 - 13.5%.
  - 3. Type III: Maximum nominal size aggregate; 9.5 mm (3/8-inch). Application rate: 18 lbs/sq.yd. Residual Asphalt Content: 6.5 - 12%.]

## PART 3 - EXECUTION

### 3.01 SUB-GRADE

- A. Bring areas to be surfaced to required subgrades by cutting and filling with suitable equipment.
- B. Scarify subgrade to minimum depth of 6-inches. Bring to optimum moisture content and compact to minimum 90 percent density in accordance with ASTM D1557 by rolling with power roller. Provide hard, even surface to receive subsequent base and paving.
- C. Finish subgrade to required grades with allowance for compression and for thickness of base course and finish paving thickness.

### 3.02 SOIL STERILIZATION

- A. After sub-grade has been compacted and approved by Geotechnical Engineer, treat areas to be paved with specified soil sterilizer. Conform to the following:
  - 1. Apply 7.5 lbs. of solution per acre for each 15 gallons of water, spray apply per manufacturer's instructions.
- B. Exercise caution during storage of material and during application. Prevent injury to humans, animal life, adjacent plant life and property. Keep soil sterilization materials minimum three feet from tree wells or any plant life.
- C. Legally dispose of containers.

### 3.03 BASE COURSE

- A. Place and compact aggregate base upon finished subgrade in conformance with Section 301-2 SSPWC. Compaction: 95 percent.
- B. Thickness of Base after Compaction: As indicated on Drawings but not less than 4-inches if indicated.

### 3.04 PREPARATION - TACK COATS

- A. Apply tack coat to contact surfaces of cold joints, curbs, gutters, manholes and adjacent materials, in conformance with Section 302-5.4, SSPWC.
- B. Coat surfaces of catch basin frames with oil to prevent bonding with asphalt pavement. Do not tack coat these surfaces.

### 3.05 PLACING ASPHALT PAVEMENT - SINGLE COURSE

- A. Install redwood headers.
- B. Place asphalt in conformance with CSS Section 39. Conform to temperature maximums and minimums specified therein. Materials shall not be applied which have cooled below lower limit allowable.
  - 1. Install 1/2-inch mix for single course asphalt pavement.
- C. Place to thickness as indicated on drawings.
- D. Install drainage grilles and frames in correct position and elevation.
- E. Compact pavement by rolling with equipment specified in Section 302-5.6, SSPWC. Do not displace or extrude pavement from position.
- F. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks, rock pockets, ridges or depressions.

### 3.06 SEAL COAT

- A. Apply seal coat 30 days or more after surface course application, in accordance with manufacturer's recommendations.
- B. Apply seal coat to surface course in accordance with Section 302-8.2 SSPWC.

- C. Add water to specified seal coat material. When air temperatures of 90 degrees F or more are encountered during application, consult manufacturer for recommendations.
- D. If pavement surface exhibits imperfections noted Placing Asphalt Pavement above, as determined by the Architect, the addition of sand aggregate to seal coat, and amounts thereof, shall be as recommended by the manufacturer.
- E. A second application shall be made after first coat has dried to the touch. When sand is added to the first seal coat, two additional coats without extra sand shall be applied.
- F. Allow seal coat to dry before permitting traffic or striping.

### 3.08 PARKING BUMPERS

- A. Securely attach precast concrete parking bumpers into pavement with two 5/8-inch diameter galvanized solid rod anchors. Extend anchors 24-inches into ground.

### 3.09 ASPHALT CONCRETE SPEED BUMPS

- A. Construct hot-mix asphalt speed bumps over compacted pavement surfaces. Apply a tack coat unless pavement surface is still tacky and free from dust. Spread mix at a minimum temperature of 250 degrees F (121 degrees C).
- B. Tack Coat Application: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq.yd. (0.2 to 0.7 L/sq.m.).
- C. Asphalt Mix: Same as pavement surface-course mix.
- D. Before installation, mill pavement that will be in contact with bottom of speed bump. Mill to a depth of 1-inch (25mm) from top of pavement to a clean, rough profile.
- E. Place and compact hot-mix asphalt to cross section as indicated on drawings.
  - 1. Paint speed bump yellow per Section 32 17 23, Pavement Markings.

### 3.10 SPOT PATCHING AND REPAIRS

- A. Patching: Saw cut perimeter patch and excavate existing pavement section to sound base. Scarify and recompact the upper 12-inches of subgrade to 90% of maximum density. Excavate rectangular or trapezoidal patches, extending 12-inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
  - 1. Tack coat faces of excavation and allow to cure before paving.
  - 2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
  - 3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished with adjacent surfaces.]

### 3.11 PATCHING AND REPAIR OF ASPHALTIC CONCRETE PAVING

- A. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal.sq.yd. of surface.
  - 1. Allow tack coat to cure undisturbed before paving.

2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- B. Preparation:
1. Subgrade Preparation: Scarify earth subgrade to a depth of not less than 6-inches, and compact to 90 percent of maximum density.
  2. Moisten with water to approximate optimum moisture content, and while moist, roll until the surface is unyielding, with a power roller of such weight as to develop a pressure of not less than 200 pounds per linear inch of roller width.
  3. Correct irregularities by dressing down or filling as may be required, to bring areas to true subgrade elevations.
  4. Where filling is required, scarify the subgrade to bond the new material to the in-place material; use additional material as required, subject to the approval of the Architect, and provided by the Contractor.
  5. Remove excess material from the site to a legal disposal area.
- C. Compaction Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- E. Application General:
1. Finish elevations, extent of asphalt paving and locations of type of asphalt and class of base shall be as indicated and specified. Bring subgrade elevations sufficiently below the finish elevations of the paving so as to accommodate the thickness of paving and base.
  2. Compaction expressed in percentages in this section refers to the maximum dry density determined by Test Method No. 2016-F as described in the Caltrans "Manual of Tests".
- F. Application of Base Course
1. Placing Aggregate Subbase Coarse: Place sub-base course on the compacted sub-grade and compact in accordance with CALTRANS "Standard Specifications," Article 25-1.04. Finished surface of the sub-base at any point shall not vary more than 0.08 foot above or below the grade indicated.
  2. Placing Aggregate Base Course: Place base course on the compacted aggregate sub-base course and compact in accordance with applicable provisions of CALTRANS "Standard Specifications," Sections 25 and 26. Use compacting equipment adequate for the size of the installation and capable of achieving the compaction specified.
  3. Compact each layer to a relative compaction not less than 95% of that determined by Test Method No. Calif. 216.
  4. Apply finished base course to a thickness which does not vary more than 0.05 foot from the planned thickness at any point. Reshape or rework, water, and thoroughly re-compact base that does not conform to the specified requirements.
- G. Sterilant Application: Place herbicide below asphalt paving. Meet the applicable environmental control requirements. Apply as directed by the manufacturer's printed instructions just before application of the paving. Take special care to insure that herbicide is not applied to any areas which are to be planted.
- H. Placing Asphalt Concrete Surface:
1. Paint Binder: Before the surface course is laid, paint all vertical surfaces of curbs, gutters, and drainage structures and all cold or existing pavement joints with a paint binder at an approximate rate of 0.05 to 0.10 gallon per square yard.
  2. Placing Asphaltic Concrete Surface Course: Place and compact asphaltic concrete in

- accordance with Standard Specifications, CALTRANS Section 39-5, 39-6, and 39-7.
3. Placing Asphaltic Concrete Surface Course: Spread asphaltic concrete mixture at a temperature of not less than 250 degrees F. Place by use of a self-propelled asphalt paving machine, except on small areas where inaccessibility precludes their use. On these small areas spread by means of a spreader box, or by hand methods.
    - a. Spread mixture in a single layer (two layers at Contractor's option) to such a thickness that, after receiving the final compaction, the finish paving shall have a minimum thickness as indicated.
  4. Berms, curbs, and slow down strips shall be placed with an extrusion machine or other equipment capable of shaping and compacting the material to the required cross section.
- I. Seal Coat:
1. Apply to all new asphaltic concrete paving, in accordance with SSPWC Standard Specifications, Section 302-8. Apply to all existing asphaltic concrete paving where indicated, in accordance with SSPWC Standard Specifications, Section 302-8. Dilute emulsion as directed with water not to exceed 20% of the total volume.
  2. Thoroughly clean foreign matter off pavement before application. No emulsion shall be spread when the atmospheric temperature is less than 60 degrees F., or when weather conditions are unsuitable for drying.
  3. Apply, just prior to "line" work, at rate of 0.10 gallon per square yard, at temperature between 100 and 140 degrees. If tackiness prevails, lightly dust affected areas with rock dust or fine sand.
- J. Header Board Installation: Install header boards at perimeter of pavement with stakes spaced not over 24 inches on center unless otherwise indicated. Do not install header boards where asphaltic concrete paving abuts buildings, concrete walks or curbs, or other pavements.
- K. Pavement Painting:
1. Allow seal coats to cure for ten days before applying paint.
  2. Cleaning: Sweep and clean surface to eliminate loose material and dust.
  3. Apply paint with mechanical equipment to produce uniform straight edges. Using painting equipment and templates specifically designed for this purpose. Protect adjoining work from damage.
  4. Make lines 4" wide unless otherwise indicated.
  5. Layout markings to exact requirements of Owner. Verify layout line widths, and colors prior to painting.
- L. Field Quality Control:
1. Before seal coating, flood the paved areas with water to check drainage and surface irregularities. Replace, or overlay high and low spots in an acceptable manner and water test the paving again after corrections have been made.
  2. Replace or repair deficient and damaged asphalt paving.
  3. All paving shall drain properly before being accepted. There shall be no variation greater than 1/4-inch plus or minus from a 10-foot straight edge, except at grade changes.]

### 3.12 TOLERANCES

- A. Thickness: Compact each paving course to produce the thickness indicated within the following tolerances:
1. Base Course: Plus or minus 1/2-inch.

2. Surface Course: Plus 1/4-inch, no minus.
  - B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straight edge applied transversely or longitudinally to paved areas:
    1. Base Course: 1/4-inch.
    2. Surface Course: 1/8-inch.
  - C. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4-inch.
- 3.13 PROTECTION
- A. Protect asphalt paving against vehicular traffic before and for 48 hours following seal coating.

END OF SECTION

## SECTION 323113 - CHAIN LINK FENCES AND GATES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Chain-link fences.
- 2. Swing gates.

- B. Related Requirements:

- 1. Section 033053 "Miscellaneous Cast-in-Place Concrete" for cast-in-place concrete equipment bases/pads for gate operators and controls and post footings.

#### 1.3 ACTION SUBMITTALS

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

- 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
  - a. Fence and gate posts, rails, and fittings.
  - b. Chain-link fabric, reinforcements, and attachments.
  - c. Gates and hardware.

- B. Shop Drawings: For each type of fence and gate assembly.

- 1. Include plans, elevations, sections, details, and attachments to other work.
- 2. Include accessories, hardware, gate operation, and operational clearances.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of chain-link fence, and gate.

- B. Product Test Reports: For framework strength according to ASTM F 1043.

- C. Sample Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For gate operators to include in emergency, operation, and maintenance manuals.

#### 1.6 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.

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

- a. Failure to comply with performance requirements.
  - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
- 1. Fabric Height: As indicated on Drawings.
  - 2. Steel Wire for Fabric: Wire diameter of 0.148 inch (3.76 mm).
    - a. Mesh Size: 2 inches (50 mm).
    - b. Galvanized-Coated Fabric
    - c. Zinc-Coated Fabric: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. (610 g/sq. m)] with zinc coating applied before weaving.
    - d. Coat selvage ends of metallic-coated fabric before the weaving process with manufacturer's standard clear protective coating.
  - 3. Selvage: Knuckled at both selvages.

### 2.2 FENCE FRAMEWORK

- A. Posts and Rails : ASTM F 1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:
- 1. Fence Height: As indicated on Drawings.
  - 2. Heavy-Industrial-Strength Material: Group IA, round steel pipe, Schedule 40.
    - a. Line Post: 2.875 inches (73 mm) in diameter.
    - b. End, Corner, and Pull Posts: 2.875 inches (73 mm) in diameter
  - 3. Horizontal Framework Members: Intermediate, top and bottom rails according to ASTM F 1043.
    - a. Top Rail: 1.66 inches (42 mm) in diameter.
  - 4. Brace Rails: ASTM F 1043.
  - 5. Metallic Coating for Steel Framework:
    - a. Type A: Not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating according to ASTM A 123/A 123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating according to ASTM A 653/A 653M.

### 2.3 SWING GATES

- A. General: ASTM F 900 for gate posts and single swing gate types.
- 1. Gate Leaf Width: As indicated.
  - 2. Framework Member Sizes and Strength: Based on gate fabric height as indicated.

- B. Pipe and Tubing:
  - 1. Zinc-Coated Steel: ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framework.
  - 2. Gate Posts: Round tubular steel.
  - 3. Gate Frames and Bracing: Round tubular steel.
- C. Frame Corner Construction: Welded.
- D. Hardware:
  - 1. Hinges: 180-degree outward swing.
  - 2. Latch: Permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
  - 3. Lock: District Standard.
  - 4. Closer: Locinox “mammoth” (District Standard).

## 2.4 FITTINGS

- A. Provide fittings according to ASTM F 626.
- B. Post Caps: Provide for each post.
  - 1. Provide line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: For each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
  - 1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 6 inches (152 mm) long.
  - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails to posts.
- E. Tension and Brace Bands: Pressed steel.
- F. Tension Bars: Steel, length not less than 2 inches (50 mm) shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
  - 1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, according to the following:
    - a. Hot-Dip Galvanized Steel: 0.148-inch- (3.76-mm-) diameter wire[; galvanized coating thickness matching coating thickness of chain-link fence fabric.
- I. Finish:
  - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. (366 g/sq. m) of zinc.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
  - 1. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (152 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

### 3.3 CHAIN-LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F 567 and more stringent requirements specified.
  - 1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- C. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
  - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
  - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
    - a. Exposed Concrete: Extend 2 inches (50 mm) above grade; shape and smooth to shed water.
    - b. Concealed Concrete: Place top of concrete as indicated on Drawings to allow covering with surface material.
- D. Terminal Posts: Install terminal end, corner, and gate posts according to ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- E. Line Posts: Space line posts uniformly at 96 inches (2440 mm) o.c.
- F. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
  - 1. Locate horizontal braces at midheight of fabric 72 inches (1830 mm) or higher, on fences with top rail, and at two-third fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

- G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (610 mm) o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
  - 1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches (152 mm) of bottom of fabric and tie to each post with not less than same diameter and type of wire.
  - 2. As indicated on Drawings.
- H. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fence posts. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- I. Intermediate and Bottom Rails: Secure to posts with fittings.
- J. Chain-Link Fabric: Apply fabric to inside of enclosing framework. Leave 2-inch (50-mm) bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- K. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches (380 mm) o.c.
- L. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
  - 1. Maximum Spacing: Tie fabric to line posts at 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) o.c.
- M. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

### 3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation.

### 3.5 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.

END OF SECTION 323113