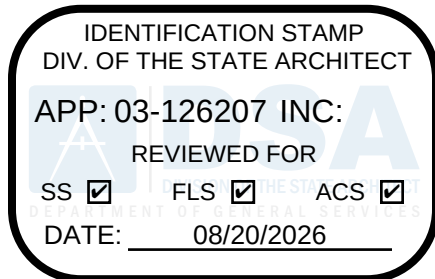


PROJECT MANUAL CONTRACTUAL-LEGAL REQUIREMENTS SPECIFICATIONS

**CESAR CHAVEZ ELEMENTARY SCHOOL
7 RELOCATABLE CLASSROOMS AND
1 RELOCATABLE TOILET BUILDING
4201 MESA MARIN DR
BAKERSFIELD, CA 93306
DSA APPLICATION # 03-126207**



Project No. 5682.1

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Project Architect**

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5682.1 BCSD Cesar Chavez Elementary School
7 RELOCATABLE CLASSROOMS AND 1 RELOCATABLE TOILET BUILDING
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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.

FORM CWM-2: DEMOLITION WASTE IDENTIFICATION				
MATERIAL DESCRIPTION	EST. QUANTITY	EST. VOLUME CY (CM)	EST. WEIGHT TONS (TONNES)	REMARKS AND ASSUMPTIONS
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 QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A X B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
Packaging: Cardboard								
Packaging: Boxes								
Packaging: Plastic Sheet or Film								
Packaging: Polystyrene								
Packaging: Pallets or Skids								
Packaging: Crates								
Packaging: Paint Cans								
Packaging: Plastic Pails								
Site-Clearing Waste								
Masonry or CMU								
Lumber: Cut-Offs								
Lumber: Warped Pieces								
Plywood or OSB (scraps)								
Wood Forms								
Wood Waste Chutes								
Wood Trim (cut-offs)								
Metals								
Insulation								
Roofing								
Joint Sealant Tubes								
Gypsum Board (scraps)								
Carpet and Pad (scraps)								
Piping								
Electrical Conduit								
Other:								

FORM CWM-6: COST/REVENUE ANALYSIS OF DEMOLITION WASTE REDUCTION WORK PLAN								
MATERIALS	TOTAL QUANTITY OF MATERIALS (VOL. OR WEIGHT) (A)	EST. COST OF DISPOSAL (B)	TOTAL EST. COST OF DISPOSAL (C = A X B)	REVENUE FROM SALVAGED MATERIALS (D)	REVENUE FROM RECYCLED MATERIALS (E)	LANDFILL TIPPING FEES AVOIDED (F)	HANDLING AND TRANSPORTATION COSTS AVOIDED (G)	NET COST SAVINGS OF WORK PLAN (H = D+E+F+G)
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.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
 - 2. Section 321313 "Concrete Paving" for concrete pavement and walks.

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 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.

E. 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.
- F. No excavation below the level of, or adjacent to, foundations of footings shall be made except in a manner approved by the Architect.
- G. A red or yellow tracer tape stating "CAUTION ELECTRIC LINE BURIED BELOW" shall be installed 12" above conduit, full length of trench.
- H. Electrical conduit shall not be run in excavations provided for plumbing or heating pipes, unless separated by a minimum of 12 inches.
- I. 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.
- J. 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

SECTION 267000 - BASIC ELECTRICAL MATERIALS AND METHODS

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 $\frac{3}{4}$ " 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. 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 2022 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:

- D. 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.
- E. 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.
- F. 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.
- G. 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.
- 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 new 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. Spare Circuit Capacity:

1. SLCs: Minimum 25 percent spare capacity.
2. NACs: Minimum 25 percent spare capacity.
3. Speaker Circuits: Minimum 25 percent spare capacity.

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

F. 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.

G. 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):

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 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:

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.

B. Related Sections

1. Section 013543, Special Environmental Requirements.
2. Section 321723, Pavement Marking.
3. Section 321828, Synthetic Running Track.

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 Sections 200, 203 and 302, SSPWC.

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 40 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: SSPWC 203-1 or AASHTO MP1, Performance Grade 64-10 South and Central Coast, Inland Valleys Regions, and shall conform to the testing requirements of Table 203-1.2 (A), Section 203 SSPWC.
- B. Asphalt Aggregate: Uniformly graded in accordance with Section 203-6.2.2, SSPWC.
- C. Class 2 Aggregate Base as defined in Section 26, CSS.

2.02 ACCESSORIES

- A. Primer: ASTM D2026, cutback type, slow curing, Grade SC-250.
- 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.
2. Recycled Plastic Parking Bumpers: 72-inches L x 6-inches W x 4-inches H, including attachment accessories, Model STWHLSTP, color: yellow. By Barco Products Company, Batavia, IL. Or equal.]
5. Installation adhesives: As recommended by parking stop and speed bump manufacturer for surface to which installed.

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 Section 302-5 SSPWC. 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 but not less than 3 inches if not indicated.
- 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. Apply adhesive to underside of concrete bumpers, as recommended by the manufacturer.
 - 1. Low-VOC emission type, heavy duty adhesives as recommended by the manufacturer or expansion-type steel bolts set in holes drilled into concrete paving.

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 or as specified below, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms after hot-mix asphalt has cooled.
 - 1. Width: 1'-6", 3" high crown radius to 16".
 - 2. 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 321313 - SITEWORK CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Cast-In-Place concrete pedestrian paving and sidewalks.
2. Curbs and gutters.
3. Concrete stairs, ramps and landings.
4. Light standard bases, fence post bases, flagpole bases, monument sign, railing footings, athletic equipment footings, and similar site structures.
5. Utility concrete pads.
6. Perimeter concrete curbing, mow strips, concrete drainage structures, swales.
7. Skateboard Deterrent Devices.
8. Integral Color concrete.
9. Dry Shake Color concrete.
10. Stain Concrete.
11. Stamped concrete.
12. Exposed aggregate finish.
13. Finish at exposed vertical surfaces.
14. Thrust Blocks.
15. Slurry Concrete.
16. Detectable Warnings
17. Vegetation Control

B. Related Sections:

1. Section 312316 Excavation.
Section 321413, Porous Unit Pavers, Detectable Warnings (Truncated Domes) and Directional texture.
2. Section 321726 Tactile/Detectable Warning Surface Tile
Section 321823, Synthetic Track and Field Surfacing.

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. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
- C. ACI 224.3R-95 - Joints in Concrete Construction
- D. ACI 318-14 - Building Code Requirements for Structural Concrete and Commentary, 2008 Edition.
- E. ACI 301 - Structural Concrete for Buildings.
- F. ASTM - American Society for Testing and Materials
 1. ASTM A185 - Steel Welded Wire Reinforcement, Plain, for Concrete
 2. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 3. ASTM C33 - Concrete Aggregates
 4. ASTM C94 - Ready-Mixed Concrete

5. ASTM C150 - Portland Cement
6. ASTM C171 - Sheet Materials for Curing Concrete
7. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete
8. ASTM C618 - Coal Fly Ash and Raw or Calcinated Natural Pozzolan for use as a Mineral Admixture on Concrete
9. ASTM C920 - Elastomeric Joint Sealants
10. ASTM C979 - Pigments for Integrally Colored Concrete
11. ASTM C1107 - Packaged Dry, Hydraulic - Cement Grout (Non-Shrink)
12. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete, Paving and Structural Construction
13. ASTM E1980-11 - Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

G. CBC - 2016 California Building Code and Supplements

1. CBC-11 - CBC Chapter 11B, Accessibility to Public Buildings, Public Accommodations, Commercial Facilities and Publicly Funded Housing
2. CBC Chapter 17A, Structural Tests and Special Inspections
3. CBC Chapter 19A, Concrete [DSA]

1.03 SUBMITTALS

- A. Placement Schedule for approval: Provide details or sketches showing location of each placement of concrete Work. Do not deviate from location of expansion joints or score lines.
- B. Design mix for each concrete mix.
- C. Steel reinforcement shop drawings, including materials, grade, bar schedules, spacing, bent bar diagrams, arrangement and supports.
- D. Submit contraction (crack control) joint, expansion, isolation and construction joint layout to Architect for approval.
- E. Product data on joint filler, sealants, curing compounds and reinforcing.
- F. Project Record Documents
 1. Accurately record actual locations of embedded sleeves, utilities and components that are concealed from view.
- G. Submit Certification of experience for color, stain, and aggregate finishers.

1.04 REGULATORY REQUIREMENTS

- A. Pedestrian walks, plazas and paving shall comply with CBC Chapter 11B. Portland Cement concrete paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.

1.05 QUALITY ASSURANCE

- A. Maintain one copy of all records on site.
- B. Acquire cement and aggregate from same source for all Work.
- C. Conform to ACI 318-14 Section 26.5.5, California Building Code, when placing concrete during hot weather.

- D. Conform to ACI 318-14 Section 26.5.4, California Building Code, when placing concrete during cold weather. No placement of concrete permitted below 50 degrees Fahrenheit.
- E. Concrete Stain and Concrete Color Installer Qualifications: Minimum 5 years experience with installing stain and color products specified, certified and approved by the manufacturer.
- F. Exposed aggregate finish installer Qualifications: Minimum 5 years experience with installing aggregate products specified.
- G. Mock-up
 - 1. Install minimum 5 feet by 5 feet mock-up of concrete sidewalk for each surface treatment specified.
 - 2. Install mock-up one month prior to installation.
 - 3. Locate as approved by the Architect.
 - 4. Use identical forming system, sub-grade type, reinforcing, expansion joints, score joints, finishing and edge trim as specified for installation.
 - 5. Architect approval required.
 - 6. Mock-up may not be used in final installation.
 - 7. Remove mock-up materials from site and dispose legally.
- H. Independent Testing Laboratory (Employed by OWNER), is responsible for observing and evaluating the following at batch plant prior to start of work and at other times as requested by the Architect or the Inspector of Record (IOR).
 - 1. Condition of batching equipment
 - 2. Conformance with design mix proportions
 - 3. Storage of materials
 - 4. Mixing equipment
 - 5. Mixing and transporting equipment
 - 6. Other testing to verify compliance if requested by the Architect or IOR.
 - 7. Pre-Construction meeting with the Independent Testing Lab, IOR, General Contractor and Batch Plant Supervisor
 - 8. Condition of concrete transport trucks/Inspection

1.06 EXTENDED WARRANTY

- A. Manufacturer shall warrant prefabricated detectable warning texture products against failure in materials or workmanship for at least the specified warranty periods. Upon written notice from Owner manufacturer shall promptly, without cost, and with least practicable inconvenience to Owner correct such defects.
 - 1. Failures include, but are not limited to, significant degradation in color fastness, conformation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly.
 - a. Significant degradation means that product loses 10 percent or more of its approved design characteristics, as determined by the authority having jurisdiction.
 - 2. Minimum Warranty Period: 5 years from date of Certified Completion.

PART 2 - PRODUCTS

2.01 CONCRETE MATERIALS

- A. Cement: ASTM C150 - Type II - Moderate, Portland Cement type, from one manufacturing plant only. [Color for exposed matrix: White cement for exposed aggregate finishes and colored concrete per Section 03 35 00].
- B. Aggregates: ASTM C33, single source for all materials. Maximum size aggregate: 1 inch.
- C. Non-Shrink Grout: ASTM C1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 4,000 psi in 24 hours and 7,500 psi in 7 days unless otherwise indicated on Drawings; of consistency suitable for application and a 30 minute working time.
- D. Crushed Aggregate Base: As specified in Section 32 12 16. Crushed rock and rock dust conforming to requirements of Section 200-1.2, SSPWC, with 3/8 inch sieve requirement waived, or Class 2 aggregate base as defined in Section 26, CSS.
- E. Integral Color Concrete with Sealer: ASTM C979, manufactured by Davis Colors, Inc, Los Angeles, CA, L.M. Scofield CHROMIX, minimum of three (3) colors, or equal in accordance with Division 01, General Requirements. Colors: As selected by Architect.
- F. Rock Salt: Sodium chloride crystals, kiln dried, coarse gradation with 100 percent passing 3/8-inch sieve and 85 percent retained on a No. 8 sieve.

2.02 ACCESSORIES

- A. Expansion Joints:
 - 1. Expansion Joint Filler - ASTM D1751: Closed cell, 1/2 inch thick; DECK-O-FOAM by W. R. Meadows, Dayton Superior or equal.
 - 2. Joint Devices: Integral extruded polystyrene plastic; 1/2 inch max. thick, with removable top strip exposing sealant trough; Snap Cap Expansion Joint Cap by W. R. Meadows or equal.
 - 3. Sealant: Polyurethane two-component type, self-leveling, for level surface application, UREXPAN NR-200 or DYNATRED for sloped surfaces, manufactured by Pecora Corp., Harleysville PA, or equal. Color shall be selected by Architect from manufacturer's standard list of colors.
 - 4. Primer: As recommended by sealant manufacturer.
 - 5. Joint Backing: ASTM C1330, Cylindrical, Type C, closed cell, polyethylene backer rod; oversized 30 to 50 percent larger than joint width. Green Rod by Nomaco Inc. or equal.
- B. Highway Fiber Expansion Joint: 1/2 inch max. thick; FIBER EXPANSION JOINT by American Highway Technology, Kankakee, IL, or equal.
- C. Slip Resistant Finish: Dry shake type White aluminum oxide abrasive grains, hardness No. 9 on Mohr's scale; Emery Non-slip, manufactured by Dayton Superior, Kansas City, KS, Emery Aggregate manufactured by Oregon Emery Co., Halsey OR, or equal as approved in accordance with Division 01, General Requirements for Substitutions.

- D. Detectable Warning Texture: Division of the State Architect (DSA/Access Compliance) approved products shall be used, compliance with CBC Sections 11B-705 and the California Accessibility Reference Manual.
1. Truncated Domes: provide raised Detectable Warnings with diameter of 0.90" min. to 0.92" max. at base tapering to 0.45" min. to 0.47" max. at top, height of 0.20" and base-to-base spacing of 0.65" min. measured between the most adjacent domes on a square grid (in-line pattern).
 - a. Truncated Dome: shall contrast visually with adjoining surfaces, light-on-dark or dark-on-light per section 11B-705.1.1.3. Material used to provide contrast shall be integral part of walking surface. Warning surface shall differ from adjoining surface in resiliency or sound to cane contact.
 2. Detectable warning surface tiles: Refer to Section 32 17 26.

2.03 CONCRETE MIX

- A. Mix and deliver concrete in accordance with Section 1905A, California Building Code. Deliver concrete in transit mixers only. Mix concrete for 10 minutes minimum at a peripheral drum speed of approximately 200 feet per minute. Mix at jobsite minimum 3 minutes. Discharge loads in less than 1-1/2 hours or under 300 revolutions of the drum, whichever comes first, after water is first added.
1. Design Mix:
 - a. Conform to ACI 318-14 Section 26.4.2 for Proportioning on the basis of field experience or trial mixtures method.
 - b. Conform to ACI 318-14 Section 26.4.2 for Selection of concrete proportions method. Selection of concrete proportions and ingredients for design mix by a DSA-approved Testing Laboratory and certified by a registered civil engineer licensed in California.
 2. Do not exceed 0.50 water-cement ratio by weight for slabs and for other concrete.
 3. Quantities of Materials: Weighmaster's records not required for sitework concrete.
 4. Required Strength: Minimum 3,000 psi for sitework concrete.
- B. Fly ash shall be used at 15% maximum replacement of the Portland cement at a 1:1 replacement ratio by weight. Fly Ash shall meet the requirements of ASTM C 618 with the exception that the Loss on Ignition shall not exceed 1.0 percent. Only Class F material is permitted.
- C. Solar Reflectivity Index (SRI) of Concrete: provide concrete mix that yields a minimum SRI of 35 with Solar Reflectance value of 0.35 and emittance of 0.9.
- D. Slurry Concrete:
1. Slump: Between 4 inches and 6 inches.
 2. Aggregate: 40 percent sand by weight, 60 percent pea gravel, minimum 1/4 inch, maximum 5/8 inch.
 3. Portland Cement: ASTM C150, 2-sack mix (2 sacks of cement per cubic yard).
 4. Sufficient water shall be added to produce a fluid, workable mix that will flow and can be pumped without segregation of aggregate. Material shall be mechanically mixed until the cement and water are thoroughly dispersed.

2.04 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615; deformed billet steel bars, in grades as follows, and conforming to CBC-19, Section 1903A.
 - 1. For No. 4 and larger bars, use 60 ksi yield grade.
 - 2. For ties and stirrups, and No. 3 and smaller bars, use 40 ksi yield grade.
 - 3. For welded bars, use ASTM A706 60 ksi yield grade.
- B. Welded Wire Reinforcement: Plain type, ASTM A185; in flat sheets; uncoated finish, 6 x 6 - W4.0 x W4.0 unless otherwise note on drawings.
- C. Tie Wire: Annealed steel, minimum 16 gage size.
- D. Dowels: ASTM A615; 60 ksi yield grade, plain steel, uncoated finish.
- E. Secondary Reinforcement (plastic shrinkage control) Fibrous Reinforcement: Fibrillated, polypropylene fibers for concrete slabs with length of 3/4", Grace Fibers by W.R. Grace, or polypropylene monofilament fibers of 3/4" length Grace Mircofibers by the W.R. Grace, or equal. Meeting requirements of ASTM C1116, Type III.
 - 1. Dosage: 1.0 lbs per cubic yard of concrete for 3/4" long fibers.

2.05 FORMS

- A. Conform to ACI 318-14 Chapter 26.
- B. Plywood Forms: APA - Medium density overlay, Group 1, Exterior, PS-1, for exposed surfaces. APA Plyform B-B, Class 1, Exterior, PS-1 for unexposed surfaces.
 - 1. Use flexible or curved forms for curves with a radius 100 feet or less.
- C. Lumber: Douglas Fir species, construction grade, Surfaced Lumber, with grade stamp clearly visible for smooth and straight exposed surface.
- D. Form Release Agent; commercially formulated form-release agent that will not bond with, stain or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.06 CURING MATERIALS

- A. Polyethylene Film ASTM C171; 10 mil thick, clear, manufactured from virgin resin with no scrap or additives, manufactured by Burke-Edoco, Long Beach, CA, or equal as approved in accordance with Division 01, General Requirements for Substitutions.
- B. Water: Potable and not detrimental to concrete.

2.07 VEGETATION CONTROL

- A. Under paving, sidewalks, curbs and gutters:
 - 1. Product:
 - a. OUST XP by Dupont Co.
 - b. Monobar-Chlorate by various manufacturers.
 - c. Or approved equal.

B. Under paving, sidewalks, curbs and gutters within 5' of landscape areas:

1. Product:
 - a. Treflan TR-10 by Dow
 - b. Or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify site conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely and will not cause hardship in placing concrete.

3.02 PREPARATION

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
- B. In locations where new concrete is doweled to existing Work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- C. Ensure sub-base or base materials have been compacted or otherwise treated.
 1. Sub-base and base preparation per Section 31 23 16 Excavation and Section 31 23 23 for Backfilling.

3.03 PLACING CONCRETE (GENERAL)

- A. Convey and deposit concrete in accordance with ACI 318-14 Chapter 26. Remove loose dirt from excavations.
- B. Notify Job Inspector minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, formed joint fillers, joint devices and accessories are not disturbed during concrete placement.
- D. Install joint fillers, primer and sealant in accordance with manufacturer's instructions.
- E. Place concrete continuously between predetermined expansion joints.
 1. Install expansion joints at vertical concrete walls at 24 feet on center unless noted otherwise on drawings.
- F. Do not interrupt successive placement; do not permit cold joints to occur. Avoid segregation of materials. Perform tamping and vibrating so as to produce a dense, smooth application free of rock pockets and voids. Do not use vibrators to move concrete horizontally.
- G. Do not allow concrete to fall free from any height which will cause materials to segregate. Maximum height of free fall permitted in any case: 5 feet.

- H. Defective Installation: Repair and clean at Contractor's expense all concrete damaged or discolored during construction. Where concrete requires repair before acceptance, the repair shall be made by removing and replacing entire section between joints and not by refinishing the damaged portion.
- I. Proper curing of concrete surfaces is the responsibility of the Contractor. Concrete failing to meet specified strength shall be removed and replaced.

3.04 ON-SITE CONCRETE SIDEWALKS, PEDESTRIAN PAVED AREAS AND RAMPS

- A. Forms, Wood: Free from warp, with smooth and straight upper edges, surfaced one side, minimum thickness 1-1/2 inches adequate to resist springing or deflection from placing concrete.
- B. Forms, Metal: Gauge thickness sufficient to provide rigidity and strength equivalent to wood.
- C. Reinforcing Steel: #4 bars, place bars at 18 inches on center each way at mid-depth for fire lanes.
- D. Concrete Placement: Dampen subgrade to retain moisture in concrete mix. Tamp and spade to consolidate concrete for entire length of pour. Strike off upper surface to specified grades.
- E. Isolation Joints: Locate at slabs abutting vertical concrete surfaces and as patterned on drawings. Install vertically, full depth of concrete with preformed joint filler recessed for plastic cap at 1/2 inch depth at top for sealant application.
 - 1. Doweled Isolation Joints at Heavy Vehicle Driveways and Parking: At abutting building foundations; provide 1/2-inch diameter smooth steel dowels 14 inches long, one end of dowel lubricated and set in capped sleeve to allow for longitudinal movement, spaced at 24 inches on center maximum, 6 inches from edges.
 - 2. Monolithic Curb and Gutter: No expansion joints required between gutter and curb face.
- F. Expansion Joints: Locate maximum 24 feet centers and as patterned on drawings. Install vertically full depth of concrete, install preformed joint filler recessed for plastic cap at 1/2" depth at top for sealant application.
 - 1. Monolithic Curb and Gutter: No expansion joint required between gutter and curb face.
- G. Contraction/Crack Control Joints: At 8 feet each way at concrete paved areas, and 5 feet at sidewalks, tool joint with 1/2 inch radius, depth 1/4 the thickness of slab but not less than 1 inch deep. Refer to drawings for required design patterns.
- H. Curb Ramps: Provide patterns as indicated in drawings. Detectable Warnings at Curb Ramps per CBC 11B-705.1.1 and 11B-705.1.2.2
 - 1. Detectable Warnings (Truncated Domes) required at all Curb Ramps.
 - a. Plastics/Composites: Cast in place plastic tiles per manufacturer's instructions and in accordance with CBC.
 - 1) Specified in Section 32 17 26 Tactile/Detectable Warning Surface Tile.
- I. Finish:
 - 1. Portland cement paving shall be stable, firm, and slip resistant and shall comply with CBC Sections 11B-302 and 11B-403.

2. Screed concrete to required grade, float to a smooth, flat, uniform surface. Edge all headers to 1/2 inch radius. Edge expansion joints to 1/4 inch radius. Steel trowel to hard surface.
3. Medium Broom Finish: After final troweling, apply a medium broom finish transverse to centerline or direction of traffic.
4. Heavy Broom Finish at Ramps: After final troweling, apply a heavy broom finish transverse to centerline or direction of traffic.
5. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
6. Surface Cross slopes: surface cross slopes shall not exceed one unit vertical in 50 units horizontal (2-percent).

J. Curing: Cure surfaces utilizing one of the following methods:

1. Spraying: Spray water over slab areas and maintain wet for 7 days, use burlap mats.
2. Spread polyethylene film over slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
3. Apply liquid curing compound at rate of 200 sf per gallon, using power sprayer equipped with agitator. Do not apply liquid curing compound to surfaces scheduled to receive paving units of any kind.

K. Remove expansion joint plastic caps. Prime both sides of joint and apply self-leveling sealant per Section 07 92 00. Provide smooth concave surface.

3.05 LIGHT STANDARD BASES, FENCE POST BASES, FLAGPOLE BASES, RAILING FOOTINGS, MISCELLANEOUS SURFACES, UTILITY PADS, AND SIMILAR SITE STRUCTURES.

- A. Forms: Suitable material and type, size, shape, quality and strength to ensure construction as designed, true to line and sufficiently rigid to resist deflection during placing of concrete. Clean forms of all dirt, mortar and foreign matter before use.
- B. Reinforcement: Place accurately and hold in position, using metal chairs, spacers, metal hangers, supporting wires and other devices of sufficient strength to resist crushing under full load. Clean reinforcing steel of mortar, oil, dirt, loose mill scale loose or thick rust and coatings.
- C. Coordinate installation of conduits, cast in place items and other inserts.
- D. Finish: Grind or sack as required as determined by the Architect to produce a smooth, straight, plumb and acceptable finish without burrs or form marks. For horizontal surfaces: provide float finish.
- E. Curing: Cure surfaces utilizing one of the following methods:
 1. Spraying: Spray water over slab areas and maintain wet for 7 days.
 2. Spread polyethylene film over slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
 3. Apply liquid curing compound at rate of 200 square feet per gallon, using power sprayer equipped with agitator. Do not apply liquid curing compound to surfaces scheduled to receive paving units or finish of any kind.
- F. Flagpole bases: refer to Section 10 75 00, Flagpoles for size of footings and cast in place items supplied by that section.

G. Curing: Cure surfaces utilizing one of the following methods:

1. Spread polyethylene film over areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; protect film from damage and dislodging, maintain in place for 7 days.
2. Apply liquid curing compound-clear at rate of 200 square feet per gallon, using power sprayer equipped with agitator. Do not apply liquid curing compound to surfaces scheduled to receive masonry units.

3.06 FORMED CONCRETE STAIRS AND LANDINGS

A. Subgrade Preparation: As approved by the Geotechnical Engineer.

B. Forms: Suitable material and type, size, shape, quality and strength to ensure construction as designed, true to line and sufficiently rigid to resist deflection during placing of concrete. Clean forms of all dirt, mortar and foreign matter before use.

C. Reinforcement: Place accurately and hold in position, using metal chairs, spacers, metal hangers, supporting wires and other devices of sufficient strength to resist crushing under full load. Clean reinforcing steel of mortar, oil, dirt, loose mill scale, loose or thick rust and coatings.

D. Install specified metal safety nosings flush to finished surfaces.

E. Form grooved nosing flush to finished surface, 3" wide. Grooves at 1/4" deep, 1/4" wide and at 3/4" on centers full length of stair at all treads. Apply contrasting color paint at all treads per Section 09 90 00.

F. Finish: Hard steel trowel at monolithic risers. Steel trowel surfaces treated with Slip Resistant Finish sufficiently to allow particles to extend slightly above finish surface.

1. Slip Resistant Finish: Apply in accordance with manufacturer's instructions on surfaces at a minimum rate of 50 lbs. per 100 square feet.
2. Owner's Option in lieu of Slip Resistant Finish:
 - a. Apply Medium Broom Finish.

G. Curing: Cure surfaces utilizing one of the following methods:

1. Spraying: Spray water over slab areas and maintain wet for 7 days.
2. Contractor's Option
 - a. Spread polyethylene film over slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
 - b. Apply liquid curing compound at rate of 200 square feet per gallon, using power sprayer equipped with agitator.

H. Install anti-slip tape at existing concrete stairs, all treads.

3.07 CURB AND GUTTER, PERIMETER CONCRETE CURBING, MOW STRIPS, AND CONCRETE DRAINAGE STRUCTURES

A. Subgrade Preparation: Subgrade material, base material and compaction requirements as approved by the Geotechnical Engineer.

- B. Forms: Single face type required, cut to conform exactly with face batter and radius, sufficiently rigid to resist springing or deflection from concrete placement. Clean forms of all loose dirt, mortar or similar materials and apply a light coating of oil or other suitable material prior to concrete placement.
 - 1. Slip Forms: Contractor's option upon approval of the Architect.
- C. Reinforcement: Refer to drawings for size and spacing. Interrupt reinforcement at expansion joints.
- D. Concrete Placement: Dampen subgrade to retain moisture in concrete mix. Tamp and spade to consolidate concrete to entire length of pour. Strike off upper surface to specified grades. Cut drain pipes to conform to curb batter.
- E. Expansion Joints: Locate joint filler at maximum 20 foot centers. Trim off excess filler material flush to finish surface. No sealant application required.
- F. Control Joints: at 8 feet on center, tooled joints, 1/2 inch radius.
- G. Finish: Apply thin layer of mortar of 1 part portland cement to 1-1/2 parts sand to exposed faces. Trowel to a smooth and even finish with a fine hair broom applied parallel with the line of the work. Round all edges to 1/2 inch radius. No Contractor identification permitted.
- H. Curing: Cure surfaces utilizing one of the following methods:
 - 1. Spraying: Spray water over curb and gutter and maintain wet for 7 days.
 - 2. Spread polyethylene film over areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for 7 days.
 - 3. Apply liquid-curing compound at rate of 200 sf per gallon, using power sprayer equipped with agitator.
- I. Running Track: imbed metal metric markers in concrete as laid out and required per Section 32 18 28 Synthetic Running Track Surfacing.

3.08 CONCRETE THRUST BLOCKS

- A. Refer to Section 32 84 00 Underground Sprinkler Systems and drawings for locations.
- B. Installed where the irrigation main changes direction as at ells and tees and where the irrigation main terminates. Pressure tests shall not be made for a period of 36 hours following the completion of pouring of the thrust blocks. Concrete thrust blocks for supply mains shall be sized and placed in strict accordance with the pipe manufacturer's specifications and shall be of an adequate size and so placed as to take all thrust created by the maximum internal water pressure.

3.09 FINISH AT ALL EXPOSED-SURFACES

- A. Rubbed Finish: Apply the following to smooth-formed finished concrete per ACI 301:
 - 1. Grout-Cleaned Finish (Sack-rubbed finish): Remove fins, rough spots, stains, and hardened mortar by carefully rubbing with a fine abrasive stone to a smooth even surface. Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part Portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white Portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces.

3.10 FIELD QUALITY CONTROL

- A. Provide free access to Work and cooperate with testing personnel
- B. Measure Solar Reflectivity values of Site concrete and submit reports to Architect. ASTM E1980-11

3.11 TOLERANCES

- A. Construction tolerances shall not violate dimensions, grades, slopes required by CBC for accessibility requirements. Adjust work accordingly to comply with requirements.
- B. Comply with tolerances of ACI 117 and as follows (tolerances may not exceed CBC maximum or minimum):
 - 1. Maximum deviation of 1/8 inch in 10 feet.
 - 2. Elevation: 1/4 inch (6 mm).
 - 3. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
 - 4. Surface: Gap below 10-foot- (3-m-) long, unlevelled straightedge not to exceed 1/8 inch (3 mm).
 - 5. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
 - 6. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).
 - 7. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
 - 8. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
 - 9. Joint Spacing: 3 inches (75 mm).
 - 10. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
 - 11. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.12 COLORED CONCRETE ON-SITE SIDEWALKS AND CONCRETE AREAS

- A. Conform to On-Site Concrete Sidewalks and Concrete Areas procedures specified in this Section except where specified otherwise in this paragraph.
- B. Approved Manufacturer: Davis Colors, Inc., Los Angeles, CA, L.M. Scofield Company, Los Angeles, CA, or approved equal as approved in accordance with Division 01, General Requirements for Substitutions.
- C. Materials: Cement coloring dye for exterior concrete sidewalks, ASTM C979; integral, with natural and synthetic pigments and no artificial adulterations or filters. Color as selected by the Architect from manufacturer's standard list.
- D. Weight Required: As recommended by the manufacturer for the color selected, in pounds of dye per sack of gray cement in the total batch. Add pigment by weight only, no visual proportioning permitted.
- E. Rinse mixer drum thoroughly before batching colored concrete.
- F. Add coloring agent directly to mixer at charging or mixing speed of 50 to 100 RPM for 5 to 10 minutes. Constant ratio of coloring agent to cement and materials required.
- G. Curing: Cure colored concrete surfaces strictly in accordance with the coloring material manufacturer's recommendations. Apply matching color sealer in accordance with Davis Data #CS 78-1. Do not apply polyethylene sheeting or intermittent wetting of drying.

3.13 ROCK-SALT FINISH FOR ON-SITE SIDEWALKS AND CONCRETE AREAS

- A. Rock-Salt Finish: After initial floating, troweling, or brooming, uniformly spread rock salt over paving surface at the rate of 5lb/100 sq. ft.
 - 1. Embed rock salt into plastic concrete with roller or magnesium float.
 - 2. If polyethylene will not smother other textures previously applied to concrete, cover paving surface with 1-mil thick polyethylene sheet and remove sheet when concrete has hardened and seven-day curing period has elapsed.
 - 3. After seven-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt, thereby leaving pits and holes.

END OF SECTION

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

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.
- B. Geotechnical Investigation Report provided by RMA GeoScience, Project No. 07-230555-0 dated October 20, 2023. Geotechnical investigation performed in accordance with Section 1803 of the 2022 Building Code, per report.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-applied joint sealants.
 - 2. Hot-applied joint sealants
- B. Related Sections:
 - 1. Section 079200 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.
 - 2. Section 321216 "Asphalt Paving" for constructing joints between concrete and asphalt pavement.
 - 3. Section 321313 "Concrete Paving" for constructing joints in concrete pavement.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Certificates: For each type of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for joint sealants.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.

- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- D. Unless otherwise noted, RMA GeoScience Geotechnical Report shall govern.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.⁸
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crafco Inc., an ERGON company; RoadSaver Silicone.
 - b. Dow Corning Corporation; 888.
 - c. Pecora Corporation; 301 NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crafco Inc., an ERGON company; RoadSaver Silicone SL.
 - b. Dow Corning Corporation; 890-SL.
 - c. Pecora Corporation; 300 SL.
- C. Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant for Concrete: ASTM C 920, Type M, Grade P, Class 25, for Use T.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following]:

- a. Pecora Corporation; Urexpan NR-200.

2.3 HOT-APPLIED JOINT SEALANTS

- A. Hot-Applied, Single-Component Joint Sealant: ASTM D 6690, Type I.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. W.R. Meadows Sealtight, 1190..
 - b. Right Point RP 3405.

2.4 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- D. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

2.5 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint-sealant backings.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place joint sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
 - 1. Remove excess joint sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.6 PAVEMENT-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within concrete paving PJS-#1.
 - 1. Joint Location:
 - a. Expansion and isolation joints in concrete paving.
 - b. Contraction joints in concrete paving.
 - c. Other joints as indicated.
 - 2. Joint Sealant: Urethane Joint Sealant for Concrete: Multicomponent, pourable, traffic-grade.
- B. Joint-Sealant Application: Joints within concrete paving and between concrete and asphalt paving PJS-#2.
 - 1. Joint Location:
 - a. Joints between concrete and asphalt paving.
 - b. Joints between concrete curbs and asphalt paving.
 - c. Other joints as indicated.
 - 2. Joint Sealant: Hot-applied, single-component joint sealant]
- C. Joint-Sealant Application: Joints within cement concrete pavement PJS-#3.
 - 1. Joint Location:
 - a. Expansion and isolation joints in cast-in-place concrete pavement.
 - b. Contraction joints in cast-in-place concrete slabs.
 - c. Other joints as indicated.
 - 2. Urethane Joint Sealant for Concrete: Multicomponent, pourable, traffic-grade.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this section consists of furnishing plant, labor, equipment, and material for construction of Portland cement concrete curbs, gutters, walks, mow strip and miscellaneous concrete work as shown on the Drawings and covered by this specification. Applicable portions of this specification shall cover concrete such as post footings, etc.

1.2 SUBMITTALS

- A. The Contractor shall submit for approval manufacturer's specifications, drawings, and recommendations for all materials incorporated into the project. The submittal shall include manufacturer's published data, engineering data, letter of certification or certified test laboratory report indicating that each material complies with specified standards and other requirements.
- B. Contractor shall submit gradation test results for all aggregate materials to be incorporated into the project.
- C. Contractor shall submit a concrete mix design for approval.

PART 2 - PRODUCTS

2.1 CONCRETE MIX

- A. Mix design shall be prepared by a recognized laboratory using aggregates from job stockpiles or standard mix from local ready-mix supplier in accordance with ASTM Specification C94, Alternate No. 2. Submit for approval prior to use. No salts or other additives shall be used unless specifically authorized.
- B. Concrete materials shall conform to the following specifications:
 - 1. Aggregates: ASTM C33.
 - 2. Cement: ASTM C150, Type I or II.
 - 3. Air Entraining Admixture: ASTM C260.
 - 4. Water Reducing Admixture: ASTM C494, Type A.
- C. Specifications for Mix
 - 1. Walks, Pads, Mow Strip, Ramps: 4,000 psi compressive strength at 28 days, and a water cement ratio of .45; Curbs and Gutters: 3,500 psi compressive strength at 28 days.
 - 2. Entrained air content four percent to seven percent volume.
 - 3. Three-inch slump, maximum.
 - 4. Three-quarter inch maximum aggregate size.

2.2 CURING MATERIALS

- A. Curing materials shall be of the following types:
 - 1. Kraft paper conforming to ASTM C-171.
 - 2. Mats of commercial quality and of a type used for curing concrete.

3. Burlap of commercial quality weighing not less than 14 ounces per square yard.
4. Membrane curing compound conforming to ASTM C-309.

2.3 EXPANSION JOINT FILLER

- A. Expansion joint filler shall be pre-molded filler, conforming to ASTM D-1751, 1752, 0.375 inches thick unless otherwise directed.

2.4 JOINT SEALANT

- A. Joint sealant for sidewalk or apron expansion joints shall be on part polyurethane, elastomeric sealant/adhesive conforming to Federal Specification TT-S-00230C, Type I or II, Class A.

2.5 REINFORCING STEEL

- A. Reinforcing steel shall be deformed bars, grade 40 or higher complying with ASTM A615 free of rust, oil or loose scale.

2.6 WIRE MESH

- A. Welded steel wire fabric for concrete reinforcement shall comply with ASTM A185 and shall be free of rust, oil, and dirt.

PART 3 - EXECUTION

3.1 SAMPLING AND TESTING

- A. Sampling and testing shall be done by the testing service for at least one set of three cylinders for each day's pour or every 100 cubic yards within each class, type, and/or of concrete placed. Slump and air tests shall be performed for each set of cylinders taken.
- B. Types and sizes of cylinders shall conform to ASTM C-31 and tested in accordance with ASTM C-39. Slump tests shall be performed in accordance with ASTM C-143. Air tests shall be performed in accordance with ASTM C-231.

3.2 WEATHER LIMITATIONS

- A. Except under special conditions, concrete shall be mixed and placed only when the air temperature is at least 40 degrees Fahrenheit. For placing at lower temperatures where permission is obtained from the Contracting Officer, all materials shall be heated. Means shall be provided for maintaining the concrete at a temperature of at least 50 degrees Fahrenheit for 72 hours after placing. Concrete shall be protected from freezing temperatures for the first seven days after placement. The concrete shall be covered with a canopy and heaters (with adequate ventilation) placed under the canopy to heat the air over the concrete or an insulating blanket cover shall be placed over the concrete whenever the air temperature drops below 32 degrees Fahrenheit within the seven-day curing period. Methods proposed for heating materials and protecting the concrete shall be approved by the Contracting Officer. Salt, chemicals, and other material shall not be mixed with the concrete to prevent freezing. Placing of concrete shall not be undertaken whenever there is standing water in the forms, the subgrade is soggy due to rain or if rain is indicated.

3.3 SUBGRADE AND FORMS

A. General

1. Prior to placement of forms, the Contracting Officer shall inspect the subgrade to ensure that it is smooth, compacted, and free of frozen or soft or yielding spots, and that compaction is at least 95 percent of maximum density. Backfilling within the forms will be permitted if the subgrade is brought to the above specification and care is taken to maintain the forms to line, shape, and elevation.

B. Construction Stakes

1. The Contractor shall set control stakes at breaks in grade and on even grade at intervals not to exceed 50 feet with additional stakes at vertical curves.

C. Forms

1. Forms shall be of wood or steel. Forms shall be thoroughly clean. All forms shall be set to the line and grade and shall be braced to resist deformation or displacement under load. Before placement of concrete, forms shall be lightly oiled with a good grade of lubricating oil. Wooden forms may be watered immediately in advance of the placement of concrete. Concrete shall not be poured until all forms have been inspected and approved.
2. Where wood forms are used, concrete shall cure a minimum of two days prior to removal of the forms. Steel forms may be removed after one day. Special care shall be taken to avoid spalling of edges.
3. If concrete is to be placed by the extruded method, the Contractor shall demonstrate that the machine is capable of placing a dense, uniformly compacted concrete to exact section, line, and grade.

3.4 CONSTRUCTION

- #### A.
- Concrete shall be handled from transport vehicle to the place of final deposition in a continuous manner and as rapidly as practicable. Forms shall not be splashed with concrete in advance of pouring. The concrete shall be deposited in the forms as nearly as possible in final position to avoid rehandling in the forms. Where the vertical drop is more than three feet, elephant trunks shall be used.

- #### B.
- Immediately after depositing, concrete shall be compacted by thoroughly agitating. Hand puddling or spading shall be used along the edges, corner, and angles of the forms. Where spacers are used in curb and gutter forms at points other than dummy joints, they shall be removed before initial set of the concrete, the concrete thoroughly puddled and mixed, and the void carefully filled with concrete.

3.5 FINISHING

- #### A.
- Exposed concrete shall be finished in a neat and workmanlike manner and present a uniform appearance when completed. Exposed surfaces shall be free of voids, tool marks, and unsightly irregularities. Particular attention shall be paid to the constructing and finishing of joints and edges.

- B. Unsightly, sloppy or poorly finished surfaces will constitute grounds for rejection of the particular piece of work involved. The surface of sidewalks and sidewalk crossings shall be struck off by means of a straightedge supported on the side forms with sufficient concrete maintained ahead of the straightedge at all times to assure a dense, even surface. When the concrete has reached a proper set, the surface shall be finished with a wood float. All exposed or unprotected edges shall be tooled to a radius of not more than one-half inch. Final finish shall be obtained by brooming the surface, including the tooled edge, to a gritty finish after all free moisture has disappeared from the surface. Sprinkling of cement or sand for blotting will not be permitted.

3.6 JOINTS

- A. Expansion joints shall be placed along all structures and about all features that project into, through or against the concrete. An expansion joint shall be constructed at the intersection of sidewalks, between sidewalk crossings and sidewalks, between curbs and sidewalks (except parallel curb), at the beginning and end of curb returns, and elsewhere as shown on the Drawings. Expansion joint material shall conform to the requirements of ASTM D-994. This material shall extend the full width of the structure and shall be cut to such dimensions that the base of the expansion joint shall extend to the subgrade and the top shall be depressed not less than one fourth inch nor more than one-half inch below the finished surface of the concrete. The material shall be of one piece in the vertical position in full contact with the existing concrete face against which fresh concrete is to be poured. After the concrete has set, the expansion joints shall be filled flush to the finished concrete surface with joint sealant.
- B. Application temperature of the sealing asphalt shall be between 250 degrees and 350 degrees Fahrenheit. Sealing asphalt shall be applied by pouring from a bucket with a V-shaped spout equipped with a positive shutoff to prevent spilling or dripping of asphalt. Before sealing, the joint shall be cleaned of all dirt, oil, gravel, concrete mortar or other extraneous material. Sealing shall be done in a neat, workmanlike manner. Sloppy work in sealing of expansion joints will not be tolerated.
- C. Transverse contraction joints cut a depth of one inch prior to the final set of the concrete shall be tooled in the sidewalks at intervals approximately equal to the width of the sidewalk and at 10- foot intervals in the curb and gutter. Where the sidewalk adjoins the curb (parallel to it), contraction joints in the sidewalk and curb shall be made to match where practicable.

3.7 PATCHING CONCRETE

- A. All concrete surfaces shall be inspected upon removal of forms and if they are found to contain voids, faulty joints, pockets or other areas deviating from the intent of the Drawings and specifications, they shall be classified as defective.
- B. All defective areas shall be removed and replaced or patched at the Contractor's expense. Patching will be allowed only if permission to patch is granted by the Contracting Officer. Such permission shall not be construed as an acceptance of the work or as a waiver of the Contracting Officer to require the complete removal of the work if, in his opinion, the patch did not satisfactorily restore the quality or appearance of the surface to that intended or desired.
- C. Concrete which deviates from the design dimensions or elevations by more than one-half inch shall not be patched or repaired but shall be removed and replaced at the Contractor's expense.
- D. Any concrete which is removed shall be sawcut or removed to an expansion joint so that no ragged or rough edges result.

3.8 CURING

- A. All exposed surfaces shall be covered by layers of absorptive burlap, mats or other approved material immediately after finishing. They shall be kept saturated with clean water for a minimum, initial curing period of 24 hours. Final curing shall be achieved by keeping all concrete surfaces watered through continual sprinkling of the matting or by replacing the matting with one inch of sand maintained to saturation for an additional six days. Tinted curing compounds may be used if applied in strict conformance with the manufacturer's recommendations and ASTM C-309. Approval of the Contractor's use of such curing compounds shall not be construed as relieving him of the responsibility of protecting all concrete surfaces from the effects of adverse weather conditions by supplemental methods. In the event satisfactory results are not obtained using this compound, the Contracting Officer may delete this option and require one of the other alternates to be used.

3.9 PERFORMANCE

A. Mow Strips

1. Building: 18" wide x 4" thick, Sloped $\frac{1}{4}$ " per foot away from building
2. Fence: 12" wide
3. Utility lids, Boxes, Cleanouts, Storm Drain Inlets: 12" wide x 6" thick collars.

B. Exterior Concrete:

1. New Projects – Walk Finish: Medium Broom Finish
2. Sloped Concrete walks / ramps: Heave Broom Finish
3. Existing Sites: Match Existing Finish
4. Control Joint (CJ): Located 8-feet on center max.
5. Expansion Joint (EJ): Located 24-feet on center max.
6. Extra Joints: Required at any panel corners.
7. Offset Joints / T-Joints: Non. Not Allowed. X-Joints only.

C. Truncated Dome Mats

1. Surface applied mat: not recessed into the concrete.

D. New Concrete to existing concrete tie-in / Modernizations

1. Dowel into new concrete and existing concrete to prevent settling
2. Detail a 3 re-bar @ 24" o.c., with a 12" dowel. Set 6" into existing concrete and allow for horizontal slippage in that end (dry set), and 6" into new concrete with a bond to allow for horizontal expansion and contraction movement, but no vertical displacement for the whole joint.

END OF SECTION 321600