

VOLUME TWO



**Oak Park Unified School District**

**Medea Creek Elementary School Modular Classrooms**

**Project Manual & Specifications**

**DSA Resubmission**

**DSA File# 56-45**

**DSA A# 03-119462**

**08/07/19**

**HED**

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**ARCHITECT**

I hereby certify that the Project Drawings and the Project Manual were Prepared by me or under my direct supervision and that I am a duly Registered Architect under the Laws of the State of California



\_\_\_\_\_  
Signature

**CIVIL ENGINEER**

I hereby certify that the Project Drawings and the Project Manual were Prepared by me or under my direct supervision and that I am a duly Registered Civil Engineer under the Laws of the State of California



\_\_\_\_\_  
Signature

**LANDSCAPE ARCHITECT**

I hereby certify that the Project Drawings and the Project Manual were Prepared by me or under my direct supervision and that I am a duly Registered Landscape Architect under the Laws of the State of California



*Andrew Stone*

\_\_\_\_\_  
Signature

**PLUMBING ENGINEER**

I hereby certify that the Project Drawings and the Project Manual were Prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the Laws of the State of California



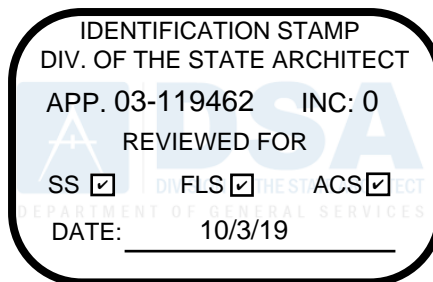
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Signature

**ELECTRICAL ENGINEER**

I hereby certify that the Project Drawings and the Project Manual were Prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the Laws of the State of California



*Roy L. Lopez*  
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 Signature



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## SECTION 012000 - PRICE AND PAYMENT PROCEDURES

## PART 1 - GENERAL

## 1.1 ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Obtain three proposals for each allowance and submit to Architect, in the form specified for Change Orders, with recommendations. Purchase products and systems selected by Architect.
- D. Advise Architect of the date when selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- E. Submit invoices to show cost and actual quantities of materials delivered.

## 1.2 UNIT PRICES

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.
- B. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

## 1.3 ALTERNATES

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

#### 1.4 SUBSTITUTION PROCEDURES

- A. Substitutions include changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor after award of the Contract.
  - 1. Substitution Request Form: CSI Form 13.1A.
  - 2. Submit three copies of each request for product substitution.
  - 3. Submit requests within 10 days after the Notice of Award.
  - 4. Do not submit unapproved substitutions on Shop Drawings or other submittals.
  - 5. Identify product to be replaced and show compliance with requirements for substitutions. Include a detailed comparison of significant qualities of proposed substitution with those of the Work specified, a list of changes needed to other parts of the Work required to accommodate proposed substitution, and any proposed changes in the Contract Sum or the Contract Time should the substitution be accepted.
  - 6. Architect will review the proposed substitution and notify Contractor of its acceptance or rejection by Change Order.

#### 1.5 CONTRACT MODIFICATION PROCEDURES

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time on AIA Document G710, "Architect's Supplemental Instructions."
- B. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work.
  - 1. Proposal Requests are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time.
- C. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
- D. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701, for all changes to the Contract Sum or the Contract Time.
- E. Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

- F. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

#### 1.6 PAYMENT PROCEDURES

- A. Submit a Schedule of Values at least seven days before the initial Application for Payment. Break down the Contract Sum into at least one line item for each Specification Section in the Project Manual table of contents. Coordinate the schedule of values with Contractor's construction schedule.
  - 1. Arrange schedule of values consistent with format of AIA Document G703.
  - 2. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  - 3. Provide separate line items in the schedule of values for initial cost of materials and for total installed value of that part of the Work.
- B. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- C. Submit three copies of each application for payment according to the schedule established in Owner/Contractor Agreement.
  - 1. With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
  - 2. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
    - a. Include insurance certificates, proof that taxes, fees, and similar obligations were paid, and evidence that claims have been settled.
    - b. Include consent of surety to final payment on AIA Document G707.
    - c. Submit final meter readings for utilities, a record of stored fuel, and similar data as of the date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012000

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## SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

## PART 1 - GENERAL

## 1.1 PROJECT MANAGEMENT AND COORDINATION

- A. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.
- B. Requests for Information (RFIs): On discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI. Use AIA Document G716-2004.
- C. Schedule and conduct progress meetings at Project site at weekly intervals. Notify Owner and Architect of meeting dates and times. Require attendance of each subcontractor or other entity concerned with current progress or involved in planning, coordination, or performance of future activities.
  - 1. Record minutes and distribute to everyone concerned, including Owner and Architect.

## 1.2 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 1. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 2. Submit three copies of each action submittal. Architect will return two copies.
  - 3. Submit two copies of each informational submittal. Architect will not return copies.
  - 4. Architect will return submittals, without review, received from sources other than Contractor.
- B. Place a permanent label or title block on each submittal for identification. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect. Include the following information on the label:
  - 1. Project name.
  - 2. Date.
  - 3. Name and address of Contractor.
  - 4. Name and address of subcontractor or supplier.
  - 5. Number and title of appropriate Specification Section.
- C. Identify deviations from the Contract Documents on submittals.
- D. Contractor's Construction Schedule Submittal Procedure: Submit two copies of schedule within 10 days after date established for Commencement of the Work.

## PART 2 - PRODUCTS

## 2.1 ACTION SUBMITTALS

- A. Product Data: Mark each copy to show applicable products and options. Include the following:
1. Manufacturer's written recommendations, product specifications, and installation instructions.
  2. Wiring diagrams showing factory-installed wiring.
  3. Printed performance curves and operational range diagrams.
  4. Testing by recognized testing agency.
  5. Compliance with specified standards and requirements.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data. Submit on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Include the following:
1. Dimensions and identification of products.
  2. Fabrication and installation drawings and roughing-in and setting diagrams.
  3. Wiring diagrams showing field-installed wiring.
  4. Notation of coordination requirements.
  5. Notation of dimensions established by field measurement.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture and for a comparison of these characteristics between submittal and actual component as delivered and installed. Include name of manufacturer and product name on label.
1. If variation is inherent in material or product, submit at least three sets of paired units that show variations.

## 2.2 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

## 2.3 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design



professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

#### 2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type schedule within 30 days of date established for the Notice of Award.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

### PART 3 - EXECUTION

#### 3.1 SUBMITTAL REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Architect will review each action submittal, make marks to indicate corrections or modifications required, will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

#### 3.2 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
  1. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribute copies of approved schedule to Owner, Architect, subcontractors, testing and inspecting agencies, and parties identified by Contractor with a need-to-know schedule responsibility. When revisions are made, distribute updated schedules to the same parties.

END OF SECTION 013000

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## SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

## 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. Preconstruction photographs.
  - 2. Periodic construction photographs.
  - 3. Final completion construction photographs.
- B. Related Requirements:
  - 1. Section 013000 "Administrative Requirements" for submitting photographic documentation.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
  - 1. Submit photos on CD-ROM or thumb-drive. Include copy of key plan indicating each photograph's location and direction.
  - 2. Identification: Provide the following information with each image description in file metadata tag:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date photograph was taken.
    - f. Description of location, vantage point, and direction.
    - g. Unique sequential identifier keyed to accompanying key plan.

#### 1.4 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

### PART 2 - PRODUCTS

#### 2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

### PART 3 - EXECUTION

#### 3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
  - 1. Date and Time: Include date and time in file name for each image.
  - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
- D. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
  - 1. Flag construction limits before taking construction photographs.
  - 2. Take minimum 20 photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take minimum 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- E. Periodic Construction Photographs: Take minimum 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

- F. Final Completion Construction Photographs: Take minimum 20 photographs after date of Substantial Completion for submission as project record documents.

END OF SECTION 013233

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## SECTION 013516 - ALTERATION PROJECT PROCEDURES

## 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 special procedures for alteration work.

## 1.3 DEFINITIONS

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

- L. Strip: To remove existing finish down to base material unless otherwise indicated.

#### 1.4 COORDINATION

- A. Alteration Work Subschedule: A construction schedule coordinating the sequencing and scheduling of alteration work for entire Project, including each activity to be performed, and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for alteration work.
  - 1. Schedule construction operations in sequence required to obtain best Work results.
  - 2. Coordinate sequence of alteration work activities to accommodate the following:
    - a. Owner's continuing occupancy of portions of existing building.
    - b. Owner's partial occupancy of completed Work.
    - c. Other known work in progress.
    - d. Tests and inspections.
  - 3. Detail sequence of alteration work, with start and end dates.
  - 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
- B. Pedestrian and Vehicular Circulation: Coordinate alteration work with circulation patterns within Project building(s) and site. Some work is near circulation patterns. Circulation patterns cannot be closed off entirely and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

#### 1.5 PROJECT MEETINGS FOR ALTERATION WORK

- A. Preliminary Conference for Alteration Work: Before starting alteration work, conduct conference at Project site.
  - 1. Attendees: In addition to representatives of Owner, Architect, and Contractor, testing service representative, and specialists, shall be represented at the meeting.
  - 2. Agenda: Discuss items of significance that could affect progress of alteration work, including review of the following:
    - a. Alteration Work Subschedule: Discuss and finalize; verify availability of materials, specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
    - b. Fire-prevention plan.
    - c. Governing regulations.
    - d. Areas where existing construction is to remain and the required protection.
    - e. Hauling routes.
    - f. Sequence of alteration work operations.
    - g. Storage, protection, and accounting for specially fabricated items.
    - h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
    - i. Qualifications of personnel assigned to alteration work and assigned duties.
    - j. Requirements for extent and quality of work, tolerances, and required clearances.



- k. Embedded work such as anchor bolts, special details, collection of waste, protection of occupants and the public, and condition of other construction that affects the Work or will affect the work.
    - 3. Reporting: Record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.
  - B. Coordination Meetings: Conduct coordination meetings specifically for alteration work at weekly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
    - 1. Attendees: In addition to representatives of Owner, Architect, and Contractor, each specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of alteration work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to alteration work.
    - 2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of alteration work. Include topics for discussion as appropriate to status of Project.
      - a. Alteration Work Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities are completed within the Contract Time.
      - b. Schedule Updating: Revise Contractor's Alteration Work Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
      - c. Review present and future needs of each entity present, including review items listed in the "Preliminary Conference for Alteration Work" Paragraph in this article and the following:
        - 1) Interface requirements of alteration work with other Project Work.
        - 2) Status of submittals for alteration work.
        - 3) Access to alteration work locations.
        - 4) Effectiveness of fire-prevention plan.
        - 5) Quality and work standards of alteration work.
        - 6) Change Orders for alteration work.
    - 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 INFORMATIONAL SUBMITTALS

- A. Alteration Work Subschedule:
  - 1. Submit alteration work subschedule within seven days of date established for commencement of alteration work.

- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements that are to remain, including finish surfaces, that might be misconstrued as damage caused by Contractor's alteration work operations.
- C. Alteration Work Program: Submit 30 days before work begins.
- D. Fire-Prevention Plan: Submit 30 days before work begins.

## 1.7 QUALITY ASSURANCE

- A. Specialist Qualifications: An experienced firm regularly engaged in specialty work similar in nature, materials, design, and extent to alteration work as specified in each Section and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.
  - 1. Field Supervisor Qualifications: Full-time supervisors experienced in specialty work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on-site when specialty work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond the control of the specialist firm.
    - a. Construct new mockups of required work whenever a supervisor is replaced.
- B. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.
- C. Alteration Work Program: Prepare a written plan for alteration work for whole Project, including each phase or process and protection of surrounding materials during operations. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project alteration work program with specific requirements of programs required in other alteration work Sections.
  - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
  - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.
- E. Safety and Health Standard: Comply with ANSI/ASSE A10.6.

1.8 EXISTING MATERIALS TO REMAIN

- A. Protect construction indicated to remain against damage and soiling from construction work.

1.9 FIELD CONDITIONS

- A. Survey of Existing Conditions: Record existing conditions that affect the Work by use of measured drawings and preconstruction photographs.
  - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
- B. Discrepancies: Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Size Limitations in Existing Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within existing spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from alteration work.
  - 1. Use only proven protection methods, appropriate to each area and surface being protected.
  - 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where alteration work is being performed.
  - 3. Erect temporary barriers to form and maintain fire-egress routes.
  - 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during alteration work.
  - 5. Contain dust and debris generated by alteration work, and prevent it from reaching the public or adjacent surfaces.
  - 6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
  - 7. Protect surfaces along hauling routes from damage, wear, and staining.
  - 8. Provide supplemental sound-control treatment to isolate demolition work from other areas of the Project.
- B. Temporary Protection of Materials to Remain:
  - 1. Protect existing materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
  - 2. Do not attach temporary protection to existing surfaces except as indicated as part of the alteration work program.

- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
  - 1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by alteration work before commencing operations.
  - 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for alteration work.
  - 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
  - 1. Prevent solids such as adhesive or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from alteration work.
  - 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.2 PROTECTION FROM FIRE

- A. General: Follow fire-prevention plan and the following:
  - 1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."
  - 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
    - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
- B. Heat-Generating Equipment and Combustible Materials: Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:
  - 1. Obtain Owner's approval for operations involving use of open-flame or welding or other high-heat equipment. Notify Owner at least 72 hours before each occurrence, indicating location of such work.
  - 2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.

3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.
  4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
  5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
  6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
    - a. Train each fire watch in the proper operation of fire-control equipment and alarms.
    - b. Prohibit fire-watch personnel from other work that would be a distraction from fire-watch duties.
    - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
    - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
    - e. Maintain fire-watch personnel at each area of Project site until two hours after conclusion of daily work.
- C. Fire-Control Devices: Provide and maintain fire extinguishers, fire blankets, and rag buckets for disposal of rags with combustible liquids. Maintain each as suitable for the type of fire risk in each work area. Ensure that nearby personnel and the fire-watch personnel are trained in fire-extinguisher and blanket use.
- D. Sprinklers: Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to sprinklers, shield them temporarily with guards.
1. Remove temporary guards at the end of work shifts, whenever operations are paused, and when nearby work is complete.

### 3.3 PROTECTION DURING APPLICATION OF CHEMICALS

- A. Protect motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm or spillage resulting from applications of chemicals and adhesives.
- B. Cover adjacent surfaces with protective materials that are proven to resist chemicals selected for Project unless chemicals being used will not damage adjacent surfaces as indicated in alteration work program. Use covering materials and masking agents that are waterproof and UV resistant and that will not stain or leave residue on surfaces to which they are applied. Apply protective materials according to manufacturer's written instructions. Do not apply liquid masking agents or adhesives to painted or porous surfaces. When no longer needed, promptly remove protective materials.
- C. Do not apply chemicals during winds of sufficient force to spread them to unprotected surfaces.

- D. Neutralize alkaline and acid wastes and legally dispose of off Owner's property.
- E. Collect and dispose of runoff from chemical operations by legal means and in a manner that prevents soil contamination, soil erosion, undermining of paving and foundations, damage to landscaping, or water penetration into building interior.

### 3.4 GENERAL ALTERATION WORK

- A. Have specialty work performed only by qualified specialists.
- B. Ensure that supervisory personnel are present when work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs. Comply with requirements in Section 013233 "Photographic Documentation."
- D. Perform surveys of Project site as the Work progresses to detect hazards resulting from alterations.
- E. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
  - 1. Do not proceed with the work in question until directed by Architect.

END OF SECTION 013516

SECTION 01 3593 - OFF-SITE IMPROVEMENT PROCEDURES

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Surface improvements including street, sidewalks, curbs and gutters.
2. Utilities: Underground utilities, fire hydrants, streetlights, catch basins, parkway drains, and culverts.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Division 31 – Earthwork.
3. Division 32 - Exterior Improvements.
4. Division 33 – Utilities.

1.02 SYSTEM DESCRIPTION

A. Regulatory Requirements:

1. Comply with requirements of authorities having jurisdiction over the area.
2. Obtain and pay for permits, licenses and inspections required by authorities having jurisdiction over the area.
3. Bonds: Post as required by authorities having jurisdiction over the area.

1.03 SUBMITTALS

- A. Shop Drawings: Submit plans, sections and details of concrete Work. Submit design drawings and calculations signed and stamped by a civil and/or structural engineer licensed in the State of California.

1.04 QUALITY ASSURANCE

- A. Comply with Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials shall meet the requirements of the authorities having jurisdiction over the Work.

PART 3 - EXECUTION

3.01 GENERAL

- A. Perform the Work in accordance with the requirements of the authorities having jurisdiction over the area.
- B. Match adjoining improvements, such as construction and expansion joints, sidewalk marking patterns, and trees.
- C. Foundry or other identifying stamps or markers are not permitted to be installed on exposed portions of the Work.

3.02 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION



## SECTION 014000 - QUALITY REQUIREMENTS

## PART 1 - GENERAL

## 1.1 SECTION REQUIREMENTS

- A. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Testing and inspecting services shall be performed by independent testing agencies.
- B. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Architect for a decision.
- C. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum. The actual installation may exceed the minimum within reasonable limits. Indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision.
- D. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 6. Names of individuals making tests and inspections.
  - 7. Description of the Work and test and inspection method.
  - 8. Complete test or inspection data, test and inspection results, an interpretation of test results, and comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 9. Name and signature of laboratory inspector.
  - 10. Recommendations on retesting and reinspecting.
- E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, notices, receipts for fee payments, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- F. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated; and where required by authorities having jurisdiction, that is acceptable to authorities.

- G. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- H. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Promptly notify Architect and Contractor of irregularities or deficiencies in the Work observed during performance of its services.
  2. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
  3. Do not perform any duties of Contractor.
- I. Associated Services: Cooperate with testing agencies and provide reasonable auxiliary services as requested. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Security and protection for samples and for testing and inspecting equipment.
- J. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- K. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014000

## SECTION 014200 - REFERENCES

## PART 1 - GENERAL

## 1.1 GENERAL REQUIREMENTS

- A. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- B. Abbreviations and Acronyms: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
  2. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
  3. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
  4. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
  5. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
  6. ACI - American Concrete Institute; (Formerly: ACI International); [www.concrete.org](http://www.concrete.org)
  7. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
  8. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
  9. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
  10. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
  11. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
  12. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
  13. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
  14. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
  15. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
  16. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
  17. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
  18. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
  19. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
  20. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
  21. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
  22. API - American Petroleum Institute; [www.api.org](http://www.api.org).
  23. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
  24. ARI - American Refrigeration Institute; (See AHRI).
  25. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
  26. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
  27. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
  28. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
  29. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
  30. ASSE - American Society of Safety Engineers (The); [www.asse.org](http://www.asse.org).

31. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
32. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
33. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
34. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
35. AWPA - American Wood Protection Association; [www.awpa.com](http://www.awpa.com).
36. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
37. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
38. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
39. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
40. CEA - Consumer Electronics Association; [www.ce.org](http://www.ce.org).
41. CFFA - Chemical Fabrics and Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
42. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
43. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
44. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
45. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
46. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
47. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
48. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).
49. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
50. CSA - CSA Group; [www.csa.ca](http://www.csa.ca).
51. CSA - CSA International; (Formerly: IAS - International Approval Services); [www.csa-international.org](http://www.csa-international.org).
52. CSI - Construction Specifications Institute (The); [www.csinet.org](http://www.csinet.org).
53. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.cti.org](http://www.cti.org).
54. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
55. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
56. ECA - Electronic Components Association; (See ECIA).
57. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
58. ECIA - Electronic Components Industry Association; [www.eciaonline.org](http://www.eciaonline.org).
59. EIA - Electronic Industries Alliance; (See TIA).
60. ESD - ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
61. ETL - Intertek (See Intertek); [www.intertek.com](http://www.intertek.com).
62. FCI - Fluid Controls Institute; [www.fluidcontrolsinstitute.org](http://www.fluidcontrolsinstitute.org).
63. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
64. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
65. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
66. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
67. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
68. GANA - Glass Association of North America; [www.glasswebsite.com](http://www.glasswebsite.com).
69. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
70. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
71. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
72. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
73. HPVA - Hardwood Plywood & Veneer Association; [www.hpva.org](http://www.hpva.org).
74. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
75. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
76. IAS - International Accreditation Service; [www.iasonline.org](http://www.iasonline.org).
77. IAS - International Approval Services; (See CSA).
78. ICBO - International Conference of Building Officials; (See ICC).
79. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
80. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).

81. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
82. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
83. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
84. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
85. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).
86. IESNA - Illuminating Engineering Society of North America; (See IES).
87. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
88. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).
89. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.okstate.edu](http://www.igshpa.okstate.edu).
90. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
91. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
92. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
93. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
94. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
95. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
96. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
97. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
98. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
99. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
100. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
101. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
102. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
103. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
104. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
105. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
106. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
107. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
108. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
109. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
110. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
111. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
112. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
113. NFPA - NFPA International; (See NFPA).
114. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
115. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
116. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
117. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
118. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
119. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
120. NSF - NSF International; [www.nsf.org](http://www.nsf.org).
121. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
122. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
123. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).

124. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
125. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
126. SAE - SAE International; [www.sae.org](http://www.sae.org).
127. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
128. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
129. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
130. SEFA - Scientific Equipment and Furniture Association (The); [www.sefalabs.com](http://www.sefalabs.com).
131. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
132. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
133. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
134. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
135. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
136. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
137. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
138. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
139. SRCC - Solar Rating & Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
140. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
141. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
142. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
143. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
144. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
145. TCNA - Tile Council of North America, Inc.; [www.tileusa.com](http://www.tileusa.com).
146. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
147. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
148. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
149. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
150. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
151. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
152. UL - Underwriters Laboratories Inc.; <http://www.ul.com>.
153. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
154. WA - Wallcoverings Association; [www.wallcoverings.org](http://www.wallcoverings.org).
155. WASTEC - Waste Equipment Technology Association; [www.wastec.org](http://www.wastec.org).
156. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
157. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
158. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
159. WI - Woodwork Institute; [www.wicnet.org](http://www.wicnet.org).
160. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
161. WWPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. CBC - California Building Code.
2. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).

3. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
  4. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
  5. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).
- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.
1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
  2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
  3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
  4. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
  5. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
  6. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
  7. FG - Federal Government Publications; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  8. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  9. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
  10. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; [www.eetd.lbl.gov](http://www.eetd.lbl.gov).
  11. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
  12. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; [www.trb.org](http://www.trb.org).
  13. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  2. FED-STD - Federal Standard; (See FS).
  3. FS - Federal Specification; Available from DLA Document Services; [www.quicksearch.dla.mil](http://www.quicksearch.dla.mil).
    - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
    - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
    - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org/ccb](http://www.wbdg.org/ccb).
  4. MILSPEC - Military Specification and Standards; (See DOD).
  5. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
  6. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; [www.bearhfti.ca.gov](http://www.bearhfti.ca.gov).
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.calregs.com](http://www.calregs.com).
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; [www.cal-iaq.org](http://www.cal-iaq.org).
5. CPUC; California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
6. SCAQMD; South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200



## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

## PART 1 - GENERAL

## 1.1 SECTION REQUIREMENTS

- A. Use Charges: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated.
- B. Erosion- and Sedimentation-Control Plan: Submit plan showing compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- D. Accessible Temporary Egress: Comply with applicable provisions in CBC (California Building Code) Chapter 11B.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts and top and bottom rails.

## 2.2 TEMPORARY FACILITIES

- A. Provide field offices, storage and fabrication sheds, and other support facilities as necessary for construction operations. Store combustible materials apart from building.

## 2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.

### PART 3 - EXECUTION

#### 3.1 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
- C. Heating and Cooling: Provide temporary heating and cooling required for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- D. Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

#### 3.2 SUPPORT FACILITIES INSTALLATION

- A. Install project identification and other signs in locations approved by Owner to inform the public and persons seeking entrance to Project.
- B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

#### 3.3 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

- D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- E. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
- F. Install and maintain temporary fire-protection facilities. Comply with NFPA 241.

#### 3.4 MOISTURE AND MOLD CONTROL

- A. Before installation of weather barriers, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.
- B. After installation of weather barriers but before full enclosure and conditioning of building, protect as follows:
  - 1. Do not load or install drywall or porous materials into partially enclosed building.
  - 2. Discard water-damaged and wet material and material that begins to grow mold.
  - 3. Allow installed wet materials adequate time to dry before being enclosed.

#### 3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion.

END OF SECTION 015000

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## SECTION 016000 - PRODUCT REQUIREMENTS

## PART 1 - GENERAL

## 1.1 SECTION REQUIREMENTS

- A. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- B. Comparable Product Requests:
  - 1. Submit request for consideration of each comparable product. Do not submit unapproved products on Shop Drawings or other submittals.
  - 2. Identify product to be replaced and show compliance with requirements for comparable product requests. Include a detailed comparison of significant qualities of proposed substitution with those of the Work specified.
  - 3. Architect will review the proposed product and notify Contractor of its acceptance or rejection.
- C. Basis-of-Design Product Specification Submittal: Show compliance with requirements.
- D. Compatibility of Options: If Contractor is given option of selecting between two or more products, select product compatible with products previously selected.
- E. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  - 2. Deliver products to Project site in manufacturer's original sealed container or packaging, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  - 3. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
  - 4. Store materials in a manner that will not endanger Project structure.
  - 5. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- F. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

## PART 2 - PRODUCTS

## 2.1 PRODUCT SELECTION PROCEDURES

- A. Provide products that comply with the Contract Documents, are undamaged, and are new at the time of installation.
  - 1. Provide products complete with accessories, trim, finish, and other devices and components needed for a complete installation and the intended use and effect.
  - 2. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
  - 1. Where Specifications name a single manufacturer and product, provide the named product that complies with requirements.
  - 2. Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
  - 3. Where Specifications include a list of names of manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
- C. Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
- D. Unless otherwise indicated, Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

## SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

## PART 1 - GENERAL

## 1.1 CLOSEOUT SUBMITTALS

- A. Record Drawings: Maintain a set of prints of the Contract Drawings as record Drawings. Mark to show actual installation where installation varies from that shown originally.
  - 1. Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
- B. Operation and Maintenance Data: Submit one copy of manual. Organize data into three-ring binders with identification on front and spine of each binder, and envelopes for folded drawings. Include the following:
  - 1. Manufacturer's operation and maintenance documentation.
  - 2. Maintenance and service schedules.
  - 3. Maintenance service contracts.
  - 4. Emergency instructions.
  - 5. Spare parts list.
  - 6. Wiring diagrams.
  - 7. Copies of warranties.

## 1.2 CLOSEOUT PROCEDURES

- A. Substantial Completion: Before requesting Substantial Completion inspection, complete the following:
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, maintenance service agreements, and similar documents.
  - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 5. Submit record Drawings and Specifications, operation and maintenance manuals, property surveys, and similar final record information.
  - 6. Deliver tools, spare parts, extra materials, and similar items.
  - 7. Make final changeover of permanent locks and deliver keys to Owner.
  - 8. Complete startup testing of systems.
  - 9. Remove temporary facilities and controls.
  - 10. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  - 11. Complete final cleaning requirements, including touchup painting.
  - 12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- B. Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will proceed with inspection or advise Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will advise Contractor of items that must be completed or corrected before certificate will be issued.
- C. Request inspection for Final Completion, once the following are complete:
  - 1. Submit a copy of Substantial Completion inspection list stating that each item has been completed or otherwise resolved for acceptance.
  - 2. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- D. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- E. Submit a written request for final inspection for acceptance. On receipt of request, Architect will proceed with inspection or advise Contractor of unfulfilled requirements. Architect will prepare final Certificate for Payment after inspection or will advise Contractor of items that must be completed or corrected before certificate will be issued.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 EXAMINATION AND PREPARATION

- A. Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Verify compatibility with and suitability of substrates.
  - 2. Examine roughing-in for mechanical and electrical systems.
  - 3. Examine walls, floors, and roofs for suitable conditions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Take field measurements as required to fit the Work properly. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication.
- D. Verify space requirements and dimensions of items shown diagrammatically on Drawings.

### 3.2 CONSTRUCTION LAYOUT AND FIELD ENGINEERING

- A. Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks.
- B. Engage a land surveyor to lay out the Work using accepted surveying practices.



- C. Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project.
  - 1. At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.3 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated. Make vertical work plumb and make horizontal work level.
  - 1. Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections to form hairline joints.
  - 2. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
  - 3. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations.
- C. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- D. Use products, cleaners, and installation materials that are not considered hazardous.
- E. Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place. Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed.

### 3.4 CUTTING AND PATCHING

- A. Provide temporary support of work to be cut. Do not cut structural members or operational elements without prior written approval of Architect.
- B. Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- C. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
  - 1. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction in a manner that will minimize evidence of patching and refinishing.
  - 2. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

### 3.5 CLEANING

- A. Clean Project site and work areas daily, including common areas. Dispose of materials lawfully.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
  - 3. Remove debris from concealed spaces before enclosing the space.
  
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion:
  - 1. Remove labels that are not permanent.
  - 2. Clean transparent materials, including mirrors. Remove excess glazing compounds. Replace chipped or broken glass.
  - 3. Clean exposed finishes to a dust-free condition, free of stains, films, and foreign substances. Sweep concrete floors broom clean.
  - 4. Vacuum carpeted surfaces and wax resilient flooring.
  - 5. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication. Clean plumbing fixtures. Clean light fixtures, lamps, globes, and reflectors.
  - 6. Clean Project site, yard, and grounds, in areas disturbed by construction activities. Sweep paved areas; remove stains, spills, and foreign deposits. Rake grounds to a smooth, even-textured surface.

### 3.6 DEMONSTRATION AND TRAINING

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Include a detailed review of the following:
  - 1. Include instruction for basis of system design and operational requirements, review of documentation, emergency procedures, operations, adjustments, troubleshooting, maintenance, and repairs.

END OF SECTION 017000

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

## PART 1 - GENERAL

## 1.1 SECTION REQUIREMENTS

- A. 5.408.1 Construction waste management. Recycle and/or salvage for reuse a minimum of 65 percent of the nonhazardous construction and demolition waste in accordance with Section 5.408.1.1, 5.408.1.2 or 5.408.1.3; or meet a local construction and demolition waste management ordinance, whichever is more stringent. (2016 California Green Building Standards Code)
- B. 5.408.1.4 Documentation. Documentation shall be provided to the enforcing agency which demonstrates compliance with Sections 5.408.1.1 through 5.408.1.3. The waste management plan shall be updated as necessary and shall be accessible during construction for examination by the enforcing agency. (2016 California Green Building Standards Code)

## 1.2 INFORMATIONAL SUBMITTALS

- A. Waste Management Plan: Submit plan within seven days of date established for commencement of the Work.
- B. Waste Reduction Progress Reports: Submit concurrent with each Application for Payment. Include total quantity of waste, total quantity of waste salvaged and recycled, and percentage of total waste salvaged and recycled.
- C. Recycling and Processing Facility Records: Manifests, weight tickets, receipts, and invoices.
- D. Landfill Disposal Records: Manifests, weight tickets, receipts, and invoices.
- E. Waste Management Plan: Develop a waste management plan consisting of waste identification and waste reduction work plan. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
  - 1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

## 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.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
- C. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

## 3.2 RECYCLING WASTE

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. 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.
- C. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.
- D. Asphaltic Concrete Paving: Grind asphalt to maximum 1-1/2-inch size.
- E. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
- F. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
  - 1. Pulverize concrete to maximum 1-1/2-inch size.
- G. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
  - 1. Pulverize masonry to maximum 3/4-inch size.
  - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- H. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

- I. Metals: Separate metals by type.
- J. Asphalt Shingle Roofing: Remove and dispose of nails, staples, and accessories.
- K. 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.
- L. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- M. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.
- N. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
  - 1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.
- O. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.
- P. Conduit: Reduce conduit to straight lengths and store by type and size.

### 3.3 DISPOSAL OF WASTE

- A. 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.
- B. Do not burn waste materials.

END OF SECTION 017419

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## SECTION 018113 - ENVIRONMENTAL QUALITY REQUIREMENTS

## PART 1 - GENERAL

## 1.1 SECTION REQUIREMENTS

- A. Comply with all applicable requirements of the 2016 California Green Building Standards Code.

## 1.2 INFORMATIONAL SUBMITTALS

- A. VOC and Formaldehyde Content: Provide test reports from an approved testing agency as defined in Section 014000 "Quality Requirements." Test reports shall show compliance with applicable codes and regulations as follows:
  - 1. VOC content for architectural coatings in grams per liter (less water and less exempt compounds).
  - 2. Sealant VOC content in grams per liter (less water and less exempt compounds).
  - 3. Adhesive VOC content in grams per liter (less water and less exempt compounds).
  - 4. CARB Certification or formaldehyde content in parts per million.

## PART 2 - PRODUCTS

## 2.1 POLLUTANT CONTROL

- A. 5.504.1 Temporary ventilation. The permanent HVAC system shall only be used during construction if necessary to condition the building or areas of addition or alteration within the required temperature range for material and equipment installation. If the HVAC system is used during construction, use return air filters with a Minimum Efficiency Reporting Value (MERV) of 8, based on ASHRAE 52.2-1999, or an average efficiency of 30 percent based on ASHRAE 52.1-1992. Replace all filters immediately prior to occupancy, or, if the building is occupied during alteration, at the conclusion of construction. (2016 California Green Building Standards Code)
- B. 5.504.3 Covering of duct openings and protection of mechanical equipment during construction. At the time of rough installation and during storage on the construction site until final startup of the heating, cooling and ventilating equipment, all duct and other related air distribution component openings shall be covered with tape, plastic, sheetmetal or other methods acceptable to the enforcing agency to reduce the amount of dust, water and debris which may enter the system. (2016 California Green Building Standards Code)
- C. 5.504.4 Finish material pollutant control. Finish materials shall comply with Sections 5.504.4.1 through 5.504.4.6. (2016 California Green Building Standards Code)

- D. 5.504.4.1 Adhesives, sealants and caulks. Adhesives, sealants, and caulks used on the project shall meet the requirements of the following standards (2016 California Green Building Standards Code):
1. 5.504.4.1 Adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers and caulks shall comply with local or regional air pollution control or air quality management district rules where applicable, or SCAQMD Rule 1168 VOC limits, as shown in Tables 5.504.4.1 and 5.504.4.2. Such products shall also comply with the Rule 1168 prohibition on the use of certain toxic compounds (chloroform, ethylene dichloride, methylene chloride, perchloroethylene and trichloroethylene), except for aerosol products as specified in subsection 2, below. (2016 California Green Building Standards Code)
  2. Aerosol adhesives, and smaller unit sizes of adhesives, and sealant or caulking compounds (in units of products, less packaging, which do not weigh more than one pound and do not consist of more than 16 fluid ounces) shall comply with statewide VOC standards and other requirements, including prohibitions on use of certain toxic compounds, of California Code of Regulations, Title 17, commencing with Section 94507. (2016 California Green Building Standards Code)
- E. 5.504.4.3 Paints and coatings. Architectural paints and coatings shall comply with VOC limits in Table 1 of the ARB Architectural Coatings Suggested Control Measure, as shown in Table 5.504.4.3, unless more stringent local limits apply. The VOC content limit for coatings that do not meet the definitions for the specialty coatings categories listed in Table 5.504.4.3 shall be determined by classifying the coating as a Flat, Nonflat or Nonflat-High Gloss coating, based on its gloss, as defined in Subsections 4.21, 4.36 and 4.37 of the 2007 California Air Resources Board Suggested Control Measure, and the corresponding Flat, Nonflat or Nonflat-High Gloss VOC limit in Table 5.504.4.3 shall apply. (2016 California Green Building Standards Code)
- F. 5.504.4.4 Carpet systems. All carpet installed in the building interior shall meet at least one of the following testing and product requirements (2016 California Green Building Standards Code):
1. Carpet and Rug Institute's Green Label Plus Program;
  2. Compliant with the VOC-emission limits and testing requirements specified in the California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, February 2010 (also known as CDPH Standard Method V1.1 or Specification 01350);
  3. NSF/ANSI 140 at the Gold level or higher;
  4. Scientific Certifications Systems Sustainable Choice; or
  5. Compliant with the Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) dated July 2012 and listed in the CHPS High Performance Product Database.
- G. 5.504.4.4.1 Carpet cushion. All carpet cushion installed in the building interior shall meet the requirements of the Carpet and Rug Institute's Green Label Program. (2016 California Green Building Standards Code)
- H. 5.504.4.4.2 Carpet adhesive. All carpet adhesive shall meet the requirements of Table 5.504.4.1. (2016 California Green Building Standards Code)



- I. 5.504.4.5 Composite wood products. Hardwood plywood, particleboard and medium density fiberboard composite wood products used on the interior or exterior of the building shall meet the requirements for formaldehyde as specified in ARB’s Air Toxics Control Measure (ATCM) for Composite Wood (17 CCR 93120 et seq.). Those materials not exempted under the ATCM must meet the specified emission limits, as shown in Table 5.504.4.5. (2016 California Green Building Standards Code)
- J. 5.504.4.5.3 Documentation. Verification of compliance with this section shall be provided as requested by the enforcing agency. Documentation shall include at least one of the following (2016 California Green Building Standards Code):
  - 1. Product certifications and specifications.
  - 2. Chain of custody certifications.
  - 3. Product labeled and invoiced as meeting the Composite Wood Products regulation (see CCR, Title 17, Section 93120, et seq.).
  - 4. Exterior grade products marked as meeting the PS-1 or PS-2 standards of the Engineered Wood Association, the Australian AS/NZS 2269 or European 636 3S standards.
  - 5. Other methods acceptable to the enforcing agency.
- K. 5.504.4.6 Resilient flooring systems. For 80 percent of floor area receiving resilient flooring, installed resilient flooring shall meet at least one of the following (2016 California Green Building Standards Code):
  - 1. Certified under the Resilient Floor Covering Institute (RFCI) FloorScore program;
  - 2. Compliant with the VOC-emission limits and testing requirements specified in the California Department of Public Health’s 2010 Standard Method for the Testing and Evaluation Chambers, Version 1.1, February 2010;
  - 3. Compliant with the Collaborative for High Performance Schools California (CA-CHPS) Criteria Interpretation for EQ 7.0 and EQ 7.1 (formerly EQ 2.2) dated July 2012 and listed in the CHPS High Performance Product Database; or
  - 4. Products certified under UL GREENGUARD Gold (formerly the Greenguard Children’s & Schools Program).
- L. 5.504.4.6.1 Verification of compliance. Documentation shall be provided verifying that resilient flooring materials meet the pollutant emission limits. (2016 California Green Building Standards Code)
- M. 5.504.5.3 Filters. In mechanically ventilated buildings, provide regularly occupied areas of the building with air filtration media for outside and return air that provides at least a Minimum Efficiency Reporting Value (MERV) of 8. MERV 8 filters shall be installed prior to occupancy, and recommendations for maintenance with filters of the same value shall be included in the operation and maintenance manual. (2016 California Green Building Standards Code)

Exceptions:

- 1. An ASHRAE 10-percent to 15-percent efficiency filter shall be permitted for an HVAC unit meeting the 2013 California Energy Code having 60,000 Btu/h or less capacity per fan coil, if the energy use of the air delivery system is 0.4 W/cfm or less at design air flow.
- 2. Existing mechanical equipment.

- N. 5.504.5.3.1 Labeling. Installed filters shall be clearly labeled by the manufacturer indicating MERV rating. (2016 California Green Building Standards Code)

PART 3 - EXECUTION (Not Used)

END OF SECTION 018113

## SECTION 024116 - DEMOLITION

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Section Includes: Furnishing labor, materials and equipment necessary for demolition, dismantling, cutting and alterations as indicated, specified, or required for completion of the Work. Includes items such as the following:
1. Protection of existing improvements to remain.
  2. Cleaning existing improvements to remain.
  3. Disconnecting and capping utilities.
  4. Removing debris, waste materials, and equipment.
  5. Removal of items for performance of the Work.
  6. Salvageable items to be retained by the Owner.
- B. Related Requirements:
1. Division 01 - General Requirements.
  2. Division 22 — Plumbing.
  3. Division 23 — HVAC.
  4. Division 26 — Electrical.

## 1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating the extent of items and systems to be removed. Indicate items to be salvaged or items to be protected during demolition. Indicate locations of utility terminations and the extent of abandoned lines to be removed. Include details indicating methods and location of utility terminations.

## 1.03 QUALITY ASSURANCE

- A. Perform the Work of this section by workers skilled in the demolition of buildings and structures. Perform the Work of this section under direct superintendence at all times.
- B. Prior to commencement of Work, schedule a walkthrough with Owner's Representative to confirm Owner property items have been removed from scheduled Work areas. Identify and mark remaining property items and schedule their removal.
- C. Coordinate demolition for the correct sequence, limits, and methods. Schedule Demolition Work to create least possible inconvenience to students, staff, public and facility operations.
- D. Related Standard: ANSI/ASSE A10.6.

## 1.04 PROJECT CONDITIONS

- A. Drawings may not indicate in detail all demolition Work to be performed. Examine existing conditions to determine the full extent of required demolition.

- B. Repair damage to existing improvements or damage due to excessive demolition.
- C. Provide all measures to avoid excessive damage from inadequate or improper means and methods, improper shoring, bracing or support.
- D. If conditions are encountered that varies from those indicated, promptly notify the Architect for clarification before proceeding.

PART 2 - PRODUCTS

2.01 HANDLING OF MATERIALS

- A. Items scheduled for salvage by the Owner shall be delivered to a location designated by the Owner's Representative. Items shall be cleaned, packaged and labeled for storage.
- B. Items scheduled for reuse shall be stored on the Project site and protected from damage, theft and other deleterious conditions.

PART 3 - EXECUTION

3.01 GENERAL

- A. Protection:
  - 1. Do not commence demolition until safety partitions, barricades, warning signs and other forms of protection are installed. Refer to Section 01 5000 - Construction Facilities and Temporary Controls.
  - 2. Provide safeguards, including warning signs, lights and barricades, for protection of workers, occupants, and the public.
- B. If safety of existing construction appears to be endangered, take immediate measures to correct such conditions; cease operations and immediately notify the Owner's Representative.

3.02 DEMOLITION

- A. Do not throw or drop materials. Furnish ramps or chutes as required by the Work.
- B. Remove existing construction only to extent necessary for proper installation of Work and interfacing with existing construction. Cut back finished surfaces to straight, plumb or level lines as required for a smooth transition.
- C. Where openings are cut oversize or in improper locations, replace or repair to required condition.

3.03 CUTTING EXISTING CONCRETE

- A. Cutting of existing concrete shall be performed by skilled workers familiar with the requirements and space necessary for placing concrete. Perform concrete cutting with concrete cutting wheels and hand chisels. Do not damage concrete intended to remain.
- B. Extent of cutting of structural concrete shall be as indicated on Drawings. Cutting of non-structural concrete shall be as indicated on Drawings or as reviewed by the Architect or structural engineer. Replace concrete demolished in excess of amounts indicated.
- C. Prior to cutting or coring concrete, determine locations of hidden utilities or other existing improvements and provide necessary measures to protect them from damage.

3.04 REMOVAL OF EXISTING PLUMBING AND ELECTRICAL EQUIPMENT AND SERVICES

- A. Remove existing plumbing and electrical equipment fixtures and services not indicated for reuse and not necessary for completion of the Work. Remove abandoned lines and cap unused portions of existing lines.

3.05 REMOVAL OF OTHER MATERIALS

- A. Masonry: Cut back to joint lines and remove mortar without damaging units to remain. Allow space for repairs to backing where applicable.
- B. Woodwork: Cut or remove to a joint or panel line.
- C. Roofing: Remove as required, including accessory components such as insulation and flashings. At penetrations through existing roofing, trim cut edges back to sound roofing with openings restricted to the minimum size necessary to receive Work.
- D. Sheet Metal: Remove back to joint, lap, or connection. Secure loose and unfastened ends or edges and provide a watertight condition. Re-seal as required.
- E. Glass: Remove broken or damaged glass and clean rebates and stops of glazing channels.
- F. Modular materials such as acoustical ceiling panels, resilient tile, or ceramic tile: Remove to a natural joint without leaving damaged or defective Work where joining new Work. After flooring removal, clean substrates to remove setting materials and adhesives.
- G. Gypsum Board: Remove to a panel joint line on a stud or support line.
- H. Plaster: Saw cut plaster on straight lines, leaving a minimum 2-inch width of firmly attached metal lath for installing new lath and plaster.
- I. Remove existing improvements not specifically indicated or required but necessary to perform Work. Cut to clean lines, allowing for installation of Work.

3.06 PATCHING

- A. Patch or repair materials to remain when damaged by the performance of the Work of this section. Finish material and appearance of patch and/or repair Work shall match existing.

3.07 CLEANING

- A. Clean existing materials to remain with appropriate tools and equipment.
- B. Protect existing improvements during cleaning operations.
- C. Debris shall be dampened by fog water spray prior to transporting by truck.
- D. Debris pick-up area shall be kept broom-clean and shall be washed daily with clean water.
- E. Remove waste and debris, other than items to be salvaged. Turn over salvaged items to Owner, or store and protect for reuse where required. Continuously clean up and remove items as demolition Work progresses.
- F. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

## SECTION 032000 - CONCRETE REINFORCING

## PART 1 - GENERAL

## 1.01 SUMMARY

## A. Section Includes:

1. Concrete steel reinforcement.

## B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 32 1313 - Site Concrete Work.

## 1.02 REGULATORY REQUIREMENTS

- A. Fabrication and placement of reinforcing shall be in accordance with requirements of CBC, Chapter 19A, latest edition.

## 1.03 REFERENCES:

## A. American Society for Testing and Materials (ASTM):

1. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
2. ASTM A184 - Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
3. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
4. ASTM A496 - Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
5. ASTM A497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
6. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
7. ASTM A706 - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

## B. American Concrete Institute (ACI) Publication:

1. ACI SP-66 – ACI Detailing Manual.
2. ACI 318 – Building Code Requirements for Structural Concrete, as modified by CBC Sections 1903A and 1908A.

## C. American Welding Society (AWS):

1. AWS D1.4 – Structural Welding Code – Reinforcing Steel.

## 1.04 SUBMITTALS

- A. Shop Drawings: Submit steel reinforcement Shop Drawings in accordance with ACI 315. Include assembly diagrams, bending charts and slab plans. Indicate lengths and location of splices, size and lengths of reinforcing steel.
- B. Closeout Submittals: Record exact locations of reinforcing that vary from Shop Drawings.

#### 1.05 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement:
  - 1. Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice.
  - 2. American Welding Society (AWS).
  - 3. American Concrete Institute (ACI).
  - 4. CBC, Chapter 19A, Concrete.
- B. Source Quality Control: Refer to Division 01 Sections for general requirements and to the following paragraphs for specific procedures. Testing laboratory retained by the Owner shall select test Samples of bars, ties, and stirrups from the material at the Project Site or from the place of distribution, with each Sample consisting of not less than two 18 inch long pieces, and perform the following tests according to ASTM A615, or ASTM A706, as applicable:
  - 1. Identified Bars: If Samples are obtained from bundles as delivered from the mill, identified as to heat number, accompanied by mill analyses and mill test reports, and properly tagged with the identification certificate so as to be readily identified, perform one tensile and one bend test for each 10 tons or fraction thereof of each size of bars. Submit mill reports when Samples are selected.
  - 2. Unidentified Bars: When positive identification of reinforcing bars cannot be performed and when random Samples are obtained; perform tests for each 2.5 tons or fraction thereof, one tensile and one bend test from each size of bars.
- C. Certification of Welders: Shop and Project site welding shall be performed by welding operators certified by AWS.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- A. Avoid exposure to dirt, moisture or conditions harmful to reinforcing.
- B. Reinforcing steel bars, wire, and wire fabric shall be stored on the Project site to permit easy access for examination and identification of each shipment. Material of each shipment shall be separated for size and shape.

### PART 2 - PRODUCTS

#### 2.01 GENERAL

- A. Provide reinforcing of sizes, gages and lengths indicated, bent to indicated shapes.

#### 2.02 MATERIALS

- A. Steel Reinforcing Bars: ASTM A615, or ASTM A706 deformed grade 60 billet steel unless otherwise specified or indicated.



- B. Bars or Rod Mats: ASTM A184.
- C. Welded Wire Fabric for Reinforcement: ASTM A185.
- D. Tie Wire: ASTM A82, fully annealed, copper-bearing steel wire, 16 gage minimum.
- E. Chairs, Spacers, Supports, and Other Accessories: Standard manufacture conforming to ACI 315 fabricated from steel wire of required types and sizes. For reinforcement supported from grade, provide properly sized dense precast blocks of concrete.

### 2.03 FABRICATION OF REINFORCING BARS:

- A. Comply with CRSI Manual of Standard Practice for Reinforced Concrete Construction for fabrication of reinforcing steel.
- B. Bending and Forming: Fabricate bars of the indicated sizes and bend and form to required shapes and lengths by methods not injurious to materials. Do not heat reinforcement for bending. Bend bars No. 6 size and larger in the shop only. Bars with unscheduled kinks or bends are not permitted. Provide only tested and permitted bar materials.
- C. Welding: Provide only ASTM A706 steel where welding is indicated. Perform welding by the direct electric arc process in accordance with AWS D1.4 and specified low-hydrogen electrodes. Preheat 6 inches each side of joint. Protect joints from drafts during the cooling process; accelerated cooling is not permitted. Do not tack weld bars. Clean metal surfaces to be welded of loose scale and foreign material. Clean welds each time electrode is changed and chip burned edges before placing welds. When wire brushed, the completed welds must exhibit uniform section, smooth welded metal, feather edges without undercuts or overlays, freedom from porosity and clinkers, and good fusion and penetration into the base metal. Cut out welds or parts of welds deemed defective, using chisel, and replace with proper welding. Prequalification of welds shall be in accordance with CBC requirements.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as indicated on reviewed Shop Drawings.
- B. Before installation and just prior to placing concrete, clean reinforcing of loose scale, rust, oil, dirt and any coating that could reduce bond.
- C. Accurately position, install, and secure reinforcing to prevent displacement during the placement of concrete.
- D. Provide metal chairs to hold reinforcement the required distance above form bottoms. In beams and slab construction, provide chairs under top slab reinforcement as well as under bottom reinforcement. Space chairs so that reinforcement will not be displaced during installation. Provide metal spacers to secure proper spacing. Stirrups shall be accurately and securely wired to bars at both top and bottom. At slabs, footings, and

beams in contact with earth, provide concrete blocks to support reinforcement at required distance above grade.

- E. Install and secure reinforcement to maintain required clearance between parallel bars and between bars and forms. Lapped splices shall be installed wherever possible in a manner to provide required clearance between sets of bars. Stagger lapped splices. Dowels and bars extending through construction joints shall be secured in position against displacement before concrete is installed and subsequently cleaned of concrete encrustations while they are still soft.
- F. Do not install reinforcing in supported slabs and beams until walls and columns have been installed to underside of slabs and beams or until construction joints have been thoroughly cleaned. Reinforcing shall be inspected before placement of concrete and cleaned as required.
- G. Use deformed bars unless otherwise indicated, except for spiral reinforcement.

### 3.02 CLEAN UP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

### 3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

## SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

## A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-clad architectural cabinets that are not concealed within other construction.

## B. Related Requirements:

1. Section 123661.16 "Solid Surfacing Countertops."

## 1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.

## 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.5 ACTION SUBMITTALS

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

## B. Sustainable Design Submittals:

1. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

## C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.

2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

D. Samples for Initial Selection: For each type of exposed finish.

E. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 inches, for each type, color, pattern, and surface finish required.
  - a. Provide one sample applied to core material with specified edge material applied to one edge.
2. Thermoset Decorative Panels: 8 by 10 inches, for each color, pattern, and surface finish.
  - a. Provide edge banding on one edge.
3. Corner Pieces:
  - a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
  - b. Miter joints for standing trim.
4. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Certificates: For each type of product.
- C. Field quality-control reports.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Manufacturer of products.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar finish operations that might damage architectural cabinets have been completed in installation areas. Store cabinets in installation

areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

## 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 17 and 50 percent during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

## PART 2 - PRODUCTS

### 2.1 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the North American Architectural Woodwork Standards for cabinets indicated for construction, finishes, installation, and other requirements.
  - 1. Grade: Custom.
  - 2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.
- B. Type of Construction: Frameless.
- C. Door and Drawer-Front Style: Flush overlay.
- D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by quality standard.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Formica.
    - b. Wilsonart.
    - c. Or approved equal.

- E. Laminate Cladding for Exposed Surfaces:
  - 1. Horizontal Surfaces: Grade HGS.
  - 2. Postformed Surfaces: Grade HGP.
  - 3. Vertical Surfaces: Grade VGS.
  - 4. Edges: PVC edge banding, thick, matching laminate in color, pattern, and finish.
  - 5. Pattern Direction: Vertically for drawer fronts, doors, and fixed panels.
  
- F. Materials for Semiexposed Surfaces:
  - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, NEMA LD 3, Grade VGS.
    - a. Edges of Plastic-Laminate Shelves: PVC T-mold matching laminate in color, pattern, and finish.
    - b. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
    - c. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
  - 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
  - 3. Drawer Bottoms: Thermoset decorative panels.
  
- G. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
  
- H. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.
  
- I. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
  - 1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
  
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
  - 1. As selected by Architect from laminate manufacturer's full range.

## 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
  - 1. Wood Moisture Content: 4 to 9 percent.
  
- B. Composite Wood Products: Products shall be made using ultra-low-emitting formaldehyde resins as defined in the California Air Resources Board's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

1. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Softwood Plywood: DOC PS 1, medium-density overlay.
3. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for Test Methods 3.3, 3.4, 3.6, 3.8, and 3.10.

### 2.3 CABINET HARDWARE AND ACCESSORIES

- A. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.
- B. Back-Mounted Pulls: BHMA A156.9, B02011.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal.
- G. Drawer Slides: BHMA A156.9, B05091.
  1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
  2. Box Drawer Slides: Grade 1; for drawers not more than 6 inches high and 24 inches wide.
  3. File Drawer Slides: Grade 1HD-100; for drawers more than 6 inches high or 24 inches wide.
  4. Pencil Drawer Slides: Grade 1; for drawers not more than 3 inches high and 24 inches wide.
  5. Keyboard Slides: Grade 1; for computer keyboard shelves.
  6. Trash Bin Slides: Grade 1HD-100; for trash bins not more than 20 inches high and 16 inches wide.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.
  1. Satin Stainless Steel: ANSI/BHMA 630.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

## 2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
  - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

## 2.5 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
  - 1. Notify Architect seven days in advance of the dates and times architectural cabinet fabrication will be complete.
  - 2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.



### 3.2 INSTALLATION

- A. North American Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.
  - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
  - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semiexposed surfaces.

END OF SECTION 064116

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## SECTION 078413 - PENETRATION FIRESTOPPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

## A. Section Includes:

- 1. Penetrations in fire-resistance-rated walls.
- 2. Penetrations in horizontal assemblies.
- 3. Penetrations in smoke barriers.

## B. Related Requirements:

- 1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

## 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.4 ACTION SUBMITTALS

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

- 1. Include VOC content.

## B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

- 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

## 1.5 INFORMATIONAL SUBMITTALS

## A. Qualification Data: For Installer.

- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

#### 1.6 CLOSEOUT SUBMITTALS

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

#### 1.7 QUALITY ASSURANCE

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

#### 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

#### 1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
  - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
      - 1) UL in its "Fire Resistance Directory."

- 2) Intertek Group in its "Directory of Listed Building Products."
- 3) FM Approval in its "Approval Guide."

## 2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. 3M Fire Protection Products.
    - b. A/D Fire Protection Systems Inc.
    - c. Hilti, Inc.
    - d. Specified Technologies, Inc.
    - e. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
  2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
  3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg (74.7 Pa).
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at and no more than 50-cfm (0.024-cu. m/s) cumulative total for any 100 sq. ft. (9.3 sq. m) at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
1. Sealant shall have a VOC content of 250 g/L or less.
  2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of

Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
1. Permanent forming/damming/backing materials.
  2. Substrate primers.
  3. Collars.
  4. Steel sleeves.

### 2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

## 2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

### 3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

- C. Install fill materials by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
  2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches (76 mm) high and with minimum 0.375-inch (9.5-mm) strokes.
1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet (4.57 m) from end of wall and at intervals not exceeding 30 feet (9.14 m).
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
  2. Contractor's name, address, and phone number.
  3. Designation of applicable testing and inspecting agency.
  4. Date of installation.
  5. Manufacturer's name.
  6. Installer's name.

### 3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413



## SECTION 079200 - JOINT SEALANTS

## 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:

- 1. Sealants for interior and exterior use.

## B. Related Requirements:

- 1. Section 078413 "Penetration Firestopping" for sealing joints in fire-resistance-rated construction.
- 2. Section 092900 "Gypsum Board" for sealing perimeter joints.

## 1.3 ACTION SUBMITTALS

## A. Product Data: For each joint-sealant product.

## B. Sustainable Design Submittals:

- 1. Product Data: For sealants, indicating VOC content.
- 2. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

## C. Samples: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

## 1.4 INFORMATIONAL SUBMITTALS

## A. Manufacturer's instructions for installation and field quality control testing.

## B. Qualification Data: For qualified Installer and testing agency.

## C. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

- 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

- 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

D. Field-Adhesion Test Reports: For each sealant application tested.

E. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

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.
- 2. Test according to SWRI Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Application Conditions: Per manufacturer’s instructions.

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.
- 2. When joint substrates are wet.
- 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
- 4. Where joint position is not allowed by joint-sealant manufacturer for applications indicated.
- 5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. VOC Content: Sealants and sealant primers shall comply with the following:

- 1. Architectural sealants shall have a VOC content of 250 g/L or less.

2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
  3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.
- B. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- C. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

## 2.2 SEALANTS FOR INTERIOR USE

- A. Porous or Non-Porous Surfaces - Sealant will not be covered with Paint: One-part, nonsag, silicone joint sealant; ASTM C920 Type S, Grade NS, Class 100/50, Use NT:
1. Dow Corning; 790 Silicone Building Sealant.
  2. GE SilPruf LM SCS2700.
  3. Tremco Spectrem 1.
- B. Porous or Non-Porous Surfaces - Sealant will be covered with Paint: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF:
1. Bostik Chem-Calk 600.
  2. Pecora AC-20.
  3. Tremco Tremflex 834.
- C. Sanitary Sealant: One-part, acetoxycure silicone rubber sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT:
1. Dow Corning; 786 Mildew Resistant.
  2. GE; Sanitary SCS1700.
  3. Pecora 898.
  4. Tremco Tremsil 200.
- D. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant; ASTM C 834 (Grade 0 or better); Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Pecora AC-20 FTR.
  2. USG Sheetrock Brand Acoustical Sealant.

3. Tremco Acoustical Sealant.

### 2.3 SEALANTS FOR EXTERIOR USE

- A. Porous or Non-Porous Surfaces - Sealant will not be covered with Paint: One-part, nonsag, silicone joint sealant; ASTM C920 Type S, Grade NS, Class 100/50, Use NT:
  1. Dow Corning 790 Silicone Building Sealant.
  2. GE SilPruf LM SCS2700.
  3. Tremco; Spectrem 1.
- B. Porous or Non-Porous Surfaces - Sealant will be covered with Paint: Silyl-Terminated Polyether Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, Use NT:
  1. MasterSeal NP 150; BASF.
- C. Low-Energy Surfaces - Neutral One-Part Silicone Sealant: For adhering to sheet or peel-and-stick weather-resistant barriers (see attached for Chemical Compatibility with Other Building Materials and Sealants):
  1. Dow Corning 785 Silicone Weather Barrier Sealant.
  2. Pecora AVB Silicone.

### 2.4 ACCESSORIES

- A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- C. Cylindrical Sealant Backings: ASTM C 1330, as recommended by manufacturer to control sealant depth and otherwise contribute to producing optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.
- E. Masking Tape: Non-staining, non-absorbent type compatible with silicone sealant and adjacent surfaces.
- F. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- G. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or

harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

### 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 and the following requirements:
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
    - d. Exterior insulation and finish systems.
  - 3. Remove laitance and form-release agents from concrete.
  - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION 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. 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 sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of sealant backings.
  - 2. Do not stretch, twist, puncture, or tear sealant backings.
  - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
  - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
  - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

- G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

#### 3.4 CLEANING

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

#### 3.5 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 so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

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## SECTION 083513 - ALUMINUM BI-FOLD DOORS AND FRAMES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes: Aluminum bi-fold doors and frames.

## 1.2 ACCESSIBILITY REQUIREMENTS

- A. Door and gate hardware:

1. Doors/doorways as part of an accessible route shall comply with CBC Sections 11B-404.
2. The clear opening width for a door shall be 43" minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34" and 4" maximum projections into it between 34" and 80" above the finish floor or ground. Door closers and stops shall be permitted to be 78" minimum above the finish floor or ground. CBC Section 11B-505.2.3.
3. Handles, pulls, latches, locks, and other operable parts on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides. CBC Section 11B-505.2.7.
4. The force for pushing or pulling open a door shall be as follows: CBC Section 11B-404.2.9.
  - a. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
  - b. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds maximum to comply with CBC Section 11B-309.4.
5. Door closing speed shall be as follows: CBC Section 11B-404.2.8.
  - a. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum.
  - b. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.
6. Thresholds shall comply with CBC Section 11B-404.2.5.
7. Floor stops shall not be located in the path of travel and 4" maximum from walls.

8. Hardware (including panic hardware) shall not be provided with “Night Latch” (NL) function for any accessible doors or gates unless the following conditions are met: (Such conditions must be clearly demonstrated and indicated in the specifications)
  - a. Such hardware has a ‘dogging’ feature.
  - b. It is dogged during the time a facility is open.
  - c. Such ‘dogging’ operation is performed only by employees as their job function (non-public use).

### 1.3 REFERENCES

- A. American Architectural Manufacturers Association(AAMA).
- B. American Society for Testing and Materials(ASTM).
- C. Aluminum Association (AA).

### 1.4 SYSTEM DESCRIPTION

- A. General: In addition to requirements shown or specified, comply with:
  1. Applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component pans.
- B. Design Requirements: Arcadia 10000 Oasis Series Bi-Folding Aluminum Door is a single source package of door, doorframe and hardware that is engineered to allow doors in both directions to be folded to the side of an opening.
- C. Performance Requirements: Each assembly shall be tested in accordance with specified test methods.
  1. Resistance to corner racking shall be tested by the dual moment corner joint strength test.
  2. Structural uniform toad shall be tested in accordance with ASTM E 330.
  3. Water performance as per selected sill.
  4. Thermally enhanced with thermal break.
  5. Min. 20 psf (ASD) wind pressure design.

### 1.5 SUBMITTALS

- A. Product Data: Submit manufacturer’s product data, recommendations, and standard details for aluminum doors and frames, including independent laboratory certified tests as necessary to demonstrate compliance with specified requirements.
- B. Shop Drawings: Submit shop drawings including plans, elevations, sizes, and complete details for materials, finishes, sizes, profiles, dimensioned locations of hardware items with reinforcement, methods of anchoring, glazing, and caulking.
- C. Samples: Submit Samples of required aluminum finish on 6-inch sections of extruded aluminum.

## 1.6 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain aluminum doors, bi-fold doors, exterior sun control devices, frames, and finish, through one source from a single manufacturer.
- B. Provide test reports from AAMA accredited laboratories certifying with performance with specified requirements.

## 1.7 WARRANTY

- A. System shall be warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years after Substantial Completion.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Aluminum Bi-Fold Doors and Frames: Arcadia 10000 Oasis Series Bi-Folding Aluminum Doors.

## 2.2 MATERIALS AND ACCESSORIES

- A. Door members: Extruded 6063-T6 aluminum alloy (ASTM B221 - Alloy G.S. 10aT5).
- B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc plated steel in accordance with ASTM A-164 shall be aluminum or steel, providing the steel is properly isolated from aluminum.
- C. Glazing Gasket (compression-type design).
- D. Glazing:
  - 1. 1-inch Insulating Glass Unit (IGU) with 1/2-inch Airspace and (2) 1/4-inch Lites: Vitro Solarcool (2) Solar Bronze + Clear.
  - 2. Safety Glazing: Where safety glazing is required, provide glazing that complies with 16 CFR 1201, Category II.
- E. Sealant: See Specification 079200 "Joint Sealants."

## 2.3 HARDWARE

- A. Hardware for 10000 Oasis Series Bi-Folding Aluminum Door shall be furnished and installed by the manufacturer and shall include the following standard hardware.
  - 1. Weatherstripping for sealing between panels and between panels and frames.
  - 2. Sill track.
  - 3. Stainless steel roller guide spindle.
  - 4. Guide channel.

5. Top guide carrier/hanger.
6. Multi-point locking.

## 2.4 FINISH

- A. Finish all exposed areas of aluminum and components as indicated.
  1. Architectural Class II or I anodic coating conforming with AA-M12C22A31/AA-M12C22A41.
    - a. Anodize Color: Colornodic #11 Clear.

## 2.5 DOOR FABRICATION

- A. Stiles and rails shall be tubular sections accurately joined, flush and hairline at corners with heavy concealed reinforcement brackets secured with machine bolts, Exposed screws not permitted.
- B. Prepare internal reinforcement for hardware.

## PART 3 - EXECUTION

### 3.1 EXAMINATIONS

- A. Examine conditions and verify substrate conditions are acceptable for product installation.

### 3.2 INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturers installation instructions.

### 3.3 FIELD QUALITY CONTROL

- A. Contractors responsibility to make all necessary final adjustments to attain normal operation of each door and its mechanical hardware

END OF SECTION 083513

## Handles

Unique designs available to complement a wide range of furniture styles.

### Features

- Single flush handle operates top and bottom shoot bolts, providing unprecedented convenience
- Can be used with lever handles as a French door inactive panel lock
- Two counteractive shoot bolt rods thrown into the head and sill - activated by 90 degree rotation of handle
- Available in locking and non-locking options
- Extended escutcheon plate available for aluminum folding doors

#### 1. Aria

#### 2. Uno

#### 3. Malta

#### 4. Crest



## Locking Solutions

### Lever Compression Locking

With the perfect balance of utility, strength, and sophistication, the INTERLOCK® Lever Compression Lock is the ideal multi-point locking solution for aluminum and vinyl swing door applications. The handle-activated locking mechanism can be enhanced with shoot bolts for better security and weather performance.

#### Features

- Single-motion handle activation of deadbolt and all remote locking points
- Unique deadbolt design to increase seal compression
- Accommodates up to six locking points
- Multiple handle styles available



### Optimum 4-Point Mortice Lock

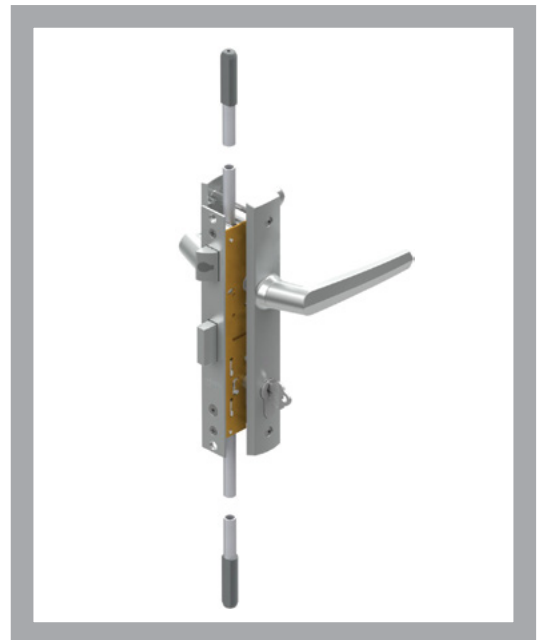
The Optimum Mortice Lock offers a new and improved locking system with enhanced furniture options available. When deadlocked, the Optimum 4-Point provides increased security with up to four points of locking. The shootbolt provides added security and seal compression.

#### Features

- Features four points of locking including the latch, deadbolt and shootbolts
- Sequencing of locking points can be in any order (can be locked with or without shootbolts thrown)
- When used with the correct strike the lock generates optimum seal compression to provide improved water and air seal performance, especially for large panel doors
- The handing of the lockset is adjusted by reversing the orientation of the latch bolt

#### Options

- Available with 30 mm, 40 mm or 50 mm backset
- Short Throw 4-Point
- Long Throw 4-Point



## Handles

With the perfect balance of utility, strength, and sophistication, the INTERLOCK® lever compression lock is the ideal multi-point locking solution for aluminum and vinyl swing door applications. The handle-activated locking mechanism can be enhanced with shoot bolts for better security and weather performance.

### Features

- Single-Motion handle activation of deadbolt and all remote locking points
- Unique deadbolt design to increase seal compression
- Accommodates up to six locking points
- Multiple handle styles available
- Lock and handles made from zinc alloy and are available in powdercoat and architectural finishes
- Latch and deadbolt made from zinc alloy and nickel plated
- Composite or stainless steel shoot bolt tips

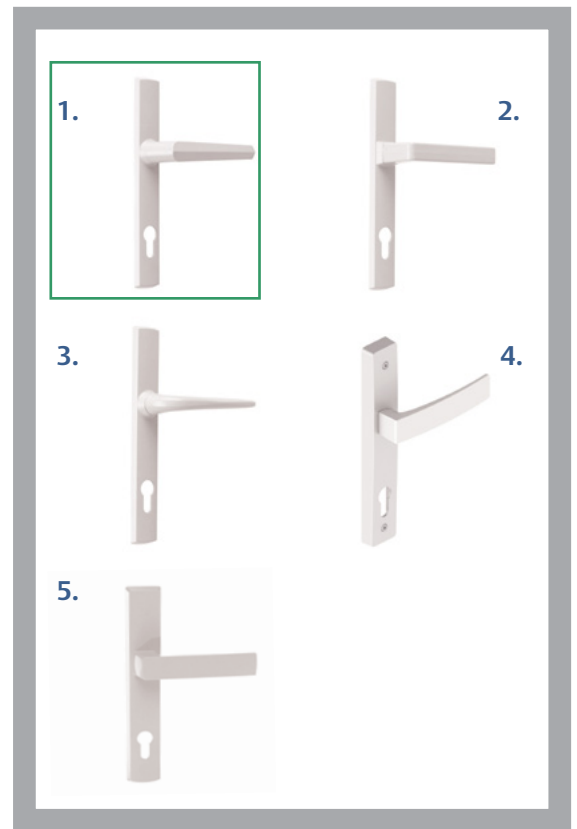
#### 1. Aria

#### 2. Acacia

#### 3. Summit

#### 4. Crest

#### 5. Malta



## Apex Mini Lever Set

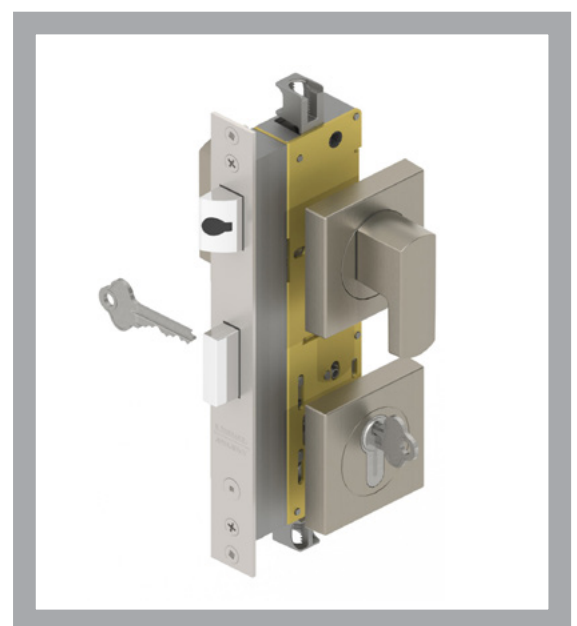
There is now a solution for those wanting to offer a multi-point locking system on entrance doors – the Apex Mini-Lever. The Apex Mini-Lever provides enough leverage to throw vertical rods, improving seal compression and security. It has been designed to be discreet, yet complementary to large pull handles.

### Features

- Sleek, minimalist design
- Independently sprung lever
- Mini lever engages locking rods in head and sill for added security and weather tightness
- Smooth and easy operation of the lock
- Kits are supplied with Standard Euro Cylinder
- Stainless Steel lock forend plate
- Brushed nickel finish

### Options

- Available with square or round escutcheons
- Double cylinder or cylinder and turnknob options available



# SECUREFOLD 100 FEATURING R-LOC

## SECUREFOLD 100

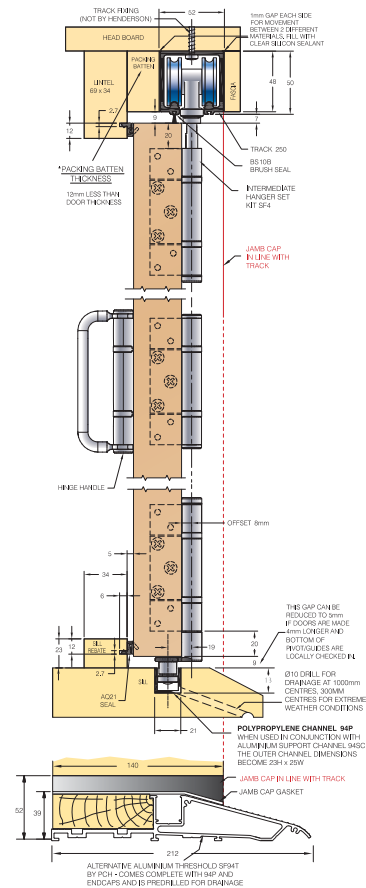
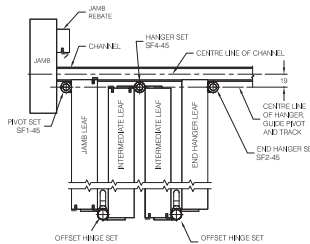
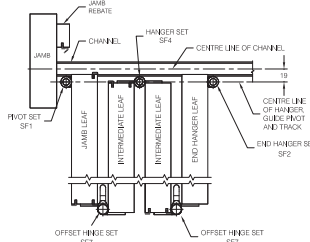
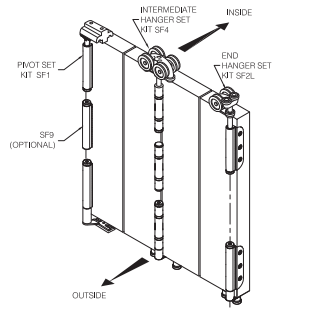
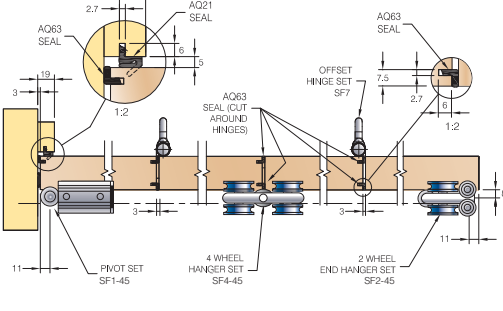
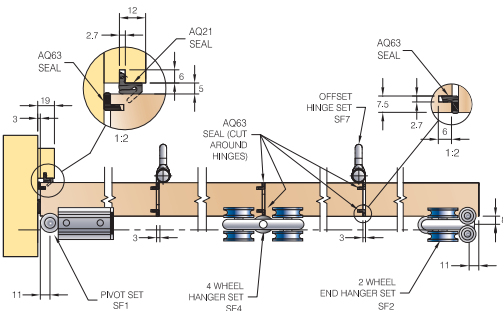
Maximum Leaf Weight	100kg
Maximum Leaf Height	3300mm
Maximum Leaf Width	1000mm*
Leaf Thickness	36-68mm**

Designed for residential and commercial applications for top hung or exterior timber doors weighing up to 100kg, the Securefold 100 system includes all of the features and benefits of the Securefold 50 with the addition of a further enhancement - R Loc. Designed with our customers in mind, R Loc is a clever ratchet system that enables installers to easily heighten or lower a door, eliminating the process of locking the hanger in place with a tiny grub screw. R Loc has been designed specifically for the Securefold range, further enhancing its credentials as one of the best folding door systems in the market.'

For aluminium doors use Securefold morticed hinge, fixing components are not supplied as standard for aluminium doors.

\* For thick and/or narrow width doors please contact P C Henderson Technical Department.

\*\* For doors between 35 – 44mm an alternative to the Securefold flushbolt is required.





## Wood System

This new Twin Bolt Lock is specifically designed for easy installation on wood folding doors and French door inactive panels. A single flush handle operates the top and bottom shoot bolts, providing unprecedented convenience for the homeowner. Additionally, our unique flush lever handle design avoids contact when panels are folded.

### Features

- Optimum security and convenience
- Features concealed shoot bolt mechanism with two counteractive shoot bolt rods thrown into the head and sills
- Stainless-steel shoot bolt rods designed for superior corrosion resistance
- Easy installation on wood applications
- Minimal fabrication required
- Available in locking and non-locking options

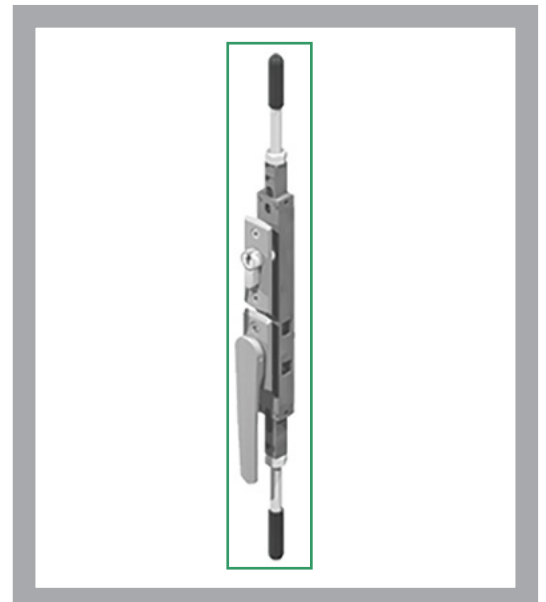


## Aluminum - Vinyl System

A superior design, our Twin Bolt Lock features a single flush handle to operate the top and bottom shoot bolts, providing unprecedented convenience for the homeowner. Providing 19 mm (3/4") of throw in both directions, this system replaces surface-mounted flush bolts. The Twin Bolt Lock can also be used as a French door inactive panel lock. Additionally, our unique flush lever handle design avoids contact when panels are folded.

### Features

- Optimum security and convenience
- Features concealed shoot bolt mechanism with two counteractive shoot bolt rods thrown into the head and sills
- Stainless-steel shoot bolt rods designed for superior corrosion resistance
- Minimal fabrication required
- Latch and deadbolt made from zinc alloy and nickel plated
- Composite or stainless steel shoot bolt tips
- Available in locking and non-locking options



No lock option  
Only handle for twin bolts

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## SECTION 084113 - ALUMINUM-FRAMED ENTRANCE AND STOREFRONT

## 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: Aluminum-framed entrance and storefront.

## 1.3 ACCESSIBILITY REQUIREMENTS

- A. Door and gate hardware:

1. Doors/doorways as part of an accessible route shall comply with California Building Code (CBC) Sections 11B-404.
2. The clear opening width for a door shall be 43" minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34" and 4" maximum projections into it between 34" and 80" above the finish floor or ground. Door closers and stops shall be permitted to be 78" minimum above the finish floor or ground. CBC Section 11B-505.2.3.
3. Handles, pulls, latches, locks, and other operable parts on accessible doors shall comply with CBC Section 11B-309.4 and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides. CBC Section 11B-505.2.7.
4. The force for pushing or pulling open a door shall be as follows: CBC Section 11B-404.2.9.
  - a. Interior hinged doors, sliding or folding doors, and exterior hinged doors: 5 pounds maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed 15 pounds. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
  - b. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be 5 pounds maximum to comply with CBC Section 11B-309.4.
5. Door closing speed shall be as follows: CBC Section 11B-404.2.8.
  - a. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is 5 seconds minimum.

- b. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is 1.5 seconds minimum.
- 6. Thresholds shall comply with CBC Section 11B-404.2.5.
- 7. Floor stops shall not be located in the path of travel and 4” maximum from walls.
- 8. Hardware (including panic hardware) shall not be provided with “Night Latch” (NL) function for any accessible doors or gates unless the following conditions are met: (Such conditions must be clearly demonstrated and indicated in the specifications)
  - a. Such hardware has a ‘dogging’ feature.
  - b. It is dogged during the time a facility is open.
  - c. Such ‘dogging’ operation is performed only by employees as their job function (non-public use).

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer’s product data, recommendations, and standard details for aluminum doors and frames, including independent laboratory certified tests as necessary to demonstrate compliance with specified requirements.
- B. Shop Drawings: Submit shop drawings including plans, elevations, sizes, and complete details for materials, finishes, sizes, profiles, dimensioned locations of hardware items with reinforcement, methods of anchoring, glazing, and caulking.
- C. Samples: Submit Samples of required aluminum finish on 6-inch sections of extruded aluminum.
- D. Delegated-Design and Deferred Submittal: Comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 REFERENCES

- A. American Architectural Manufacturers Association (AAMA).
- B. American Society for Testing and Materials (ASTM).
- C. Aluminum Association (AA).

#### 1.6 SYSTEM DESCRIPTION

- A. General: In addition to requirements shown or specified, comply with applicable provisions of AAMA Aluminum Storefront and Entrance Manual for design, materials, fabrication and installation of component parts.
- B. Structural Loads: As indicated on Drawings.
- C. Seismic Performance: Determined according to ASCE/SEI 7.

- D. Thermal Movements: Allow thermal movement resulting from the following maximum change (range) in ambient temperature.
  - 1. 120 deg F, ambient; 180 deg F, material surfaces.
- E. Performance Requirements:
  - 1. Limit air leakage through assembly to 0.06 CFM/min/sq. ft. of wall area at 6.24 PSF as measured in accordance with ASTM E283.
  - 2. Water Resistance: No water leakage when measured in accordance with ASTM E331 with a static test pressure of 8 PSF.
  - 3. Limit mullion windload deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E 330.
  - 4. System shall not deflect more than 1/8” at the center point, or 1/16” at the center point of a horizontal member, once deadload points have been established.
  - 5. System shall accommodate expansion and contraction movement due to surface temperature differential of 180 degrees F.
  - 6. Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.
  - 7. Thermal Performance: When tested in accordance with AAMA 1503.1 the following results should be attained: U-Maximum .63/CRF - minimum of 59.
  - 8. National Fenestration Rating Council (NFRC) specific application evaluation.
  - 9. Min. 20 psf (ASD) wind pressure design.

1.7 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain exterior sun control devices, bi-fold doors, entrance, storefront, windows, and finish, through one source from a single manufacturer.
- B. Provide test reports from AAMA accredited laboratories certifying the performances as specified herein.

1.8 WARRANTY

- A. System shall be warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design and Permit Approval:
  - 1. Entrance: Arcadia WS512 HD Series.
  - 2. Storefront: Arcadia AFG451T Series.

## 2.2 MATERIALS

- A. Framing members, transition members, mullions, adaptors, and mounting: Extruded 6063-T6 aluminum alloy (ASTM B221 - Alloy G.S. 10a T6).
- B. Screws, fastening devices, and internal components: Aluminum, stainless steel, or zinc-plated steel in accordance with ASTM.A-164. Perimeter anchors shall be aluminum or steel, providing the steel is properly isolated from aluminum.
- C. Glazing Gasket:
  - 1. Compression-type design, replaceable, molded or extruded, or ethylene propylene diene monomer (EPDM).
  - 2. Shall be of type that locks securely into the glazing reglet to prevent glazing gaskets from disengaging.
- D. Glazing:
  - 1. 1-inch Insulating Glass Unit (IGU) with 1/2-inch Airspace and (2) 1/4-inch Lites: Vitro Solarcool (2) Solar Bronze + Clear.
  - 2. Safety Glazing: Where safety glazing is required, provide glazing that complies with 16 CFR 1201, Category II.
- E. Sealant: See Specification 079200 "Joint Sealants."

## 2.3 HARDWARE

- A. Door Hardware:
  - 1. Mortise Lock: Schlage L-9071; Lever 03, A-Rose. Indicator L283-721 (BHMA 626).
  - 2. Interchangeable Core Mortise Cylinder: Schlage FSIC 30-008 (dogging) (BHMA 626).
  - 3. Cylinder Core: Schlage 23-030 (BHMA 626).
  - 4. Trim: Schlage (BHMA 626).
  - 5. Surface Closer: LCN 4041 XP H-62G (BHMA 689).
  - 6. Floor Stop: Trimco 1214CK X 1268CK (BHMA 626).
  - 7. Continuous Hinge: Ives 112HD (BHMA 628).
  - 8. Threshold: NGP 659 Combo, RIP for VCT or carpet (BHMA 719).
  - 9. Weatherstripping: Arcadia; hard-backed poly pile in door and/or frame.
  - 10. Sill Sweeps: Arcadia; brush strip (concealed).
  - 11. Door Position Switches: If needed, coordinate with OPUSD's selected electronic security provider.

## 2.4 FINISH

- A. Finish all exposed areas of aluminum and components as indicated.
  - 1. An Architectural Class I anodic coating conforming with AA-M12C22A31/AA-M12C22A41.

- a. Anodize finish color shall be Colornodic #11 Clear.

## 2.5 SYSTEM FABRICATION

- A. Continuous sub-sill shall be provided under sill members to collect water infiltration and divert from the interior of the system.
- B. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements, for hardware attachment, and as indicated.
- C. Fasteners shall be so located as to ensure concealment from view in the final assembly.

## PART 3 - EXECUTION

### 3.1 EXAMINATIONS

- A. Examine conditions and verify substrate conditions are acceptable for product installation.

### 3.2 INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturers installation instructions.

### 3.3 FIELD QUALITY CONTROL

- A. Test the storefront for water leaks in accordance with AAMA 501.2. Conduct test in the presence of the Architect. Correct deficiencies observed as a result of this test.

END OF SECTION 084113

Catalog Cut Summary

Mfgr	Description	Item#	Catalog Number	PAGE
IVE	CONTINUOUS HINGE		112HD	3
LCN	SURFACE CLOSER		4040XP	4
NGP	THRESHOLD		659	13
SCH	SECURITY CLSSRM LK		L9071T 03A	14
SCH	STANDARD CORE		23-030	66
SCH	MORTISE CYLINDER		20-061-ICX	67
TRI	FLR STOP + ANCHR PLT		1214CK X 1268CK	68





## Aluminum Geared Hinges



### 112HD Full Mortise - Narrow Frame and Door Leaf

UL10C certified

Meets ANSI 156.26 for 150lbs

- For 1 3/4" Doors
- Spread bearing design
- Non Handed for custom cut lengths
- Flush Mounted, No inset
- 48" Maximum Door Width
- Beveled or Square Edge Doors
- For doors weighing up to 450 pounds without reinforcing, 600 pounds with reinforcing

Standard lengths 83", 85", 95", 120"

#### Standard Mounting Hardware

12-24 x 3/4" Steel Self Drilling / Self Tapping Phillips Head Screw

#### Finishes

Clear Anodized (US28), Dark Bronze Anodized (313AN)

Custom Anodizing and Painting are available, consult factory

#### Options:

HT	Hospital Tip
EPT	Electric Power Transfer
TWP CON*	Through Wire Panel with Allegion Connect
TWP*	Electrical Through Wire Panel
TW8	Electrical Through Wire

#### Optional Mounting Hardware:

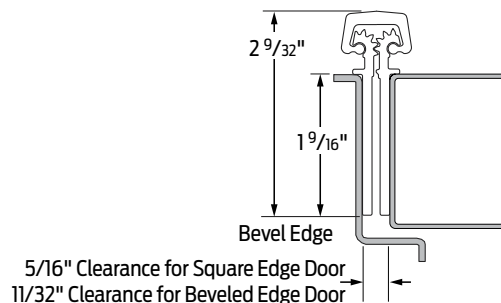
SEC/HM	Security Screws - Hollow Metal Door and Frame
SEC/WD/HM	Security Screws - 1/2 Wood, 1/2 Hollow Metal
TF	Thread Forming Screws
TEK/WD	1/2 Self Drill, Self Tap 1/2 Wood
WD	Wood Door and Frame

\*TWP only available on lengths <= 95"

#### For Single Door Applications

For pairs of doors see chart and general information

Hospital tip recommended for retrofit only



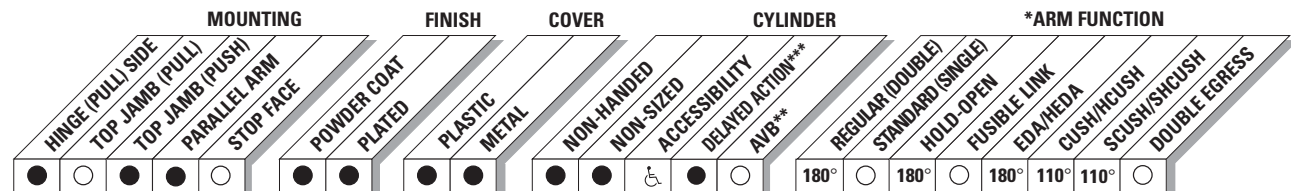


The 4040XP is LCN's most durable and flexible heavy duty closer designed for institutional and other demanding high traffic applications.

<b>Certifications</b>	Grade 1 - ANSI A156.4, UL 10C, ADA, 100 Hour Salt Spray, Meets BAA - Buy American Act
<b>Body Construction</b>	<ul style="list-style-type: none"> <li>■ Cast Iron Body</li> <li>■ Full Complement Bearings</li> <li>■ 1-1/2" Diameter Piston</li> <li>■ 3/4" Diameter Double Heat Treated Pinion Journal</li> </ul>
<b>Fluid</b>	All Weather Liquid X Fluid
<b>Handing</b>	Non-Handed
<b>Templating</b>	Peel-n-Stick templates - 2-1/4" x 5" Mounting Hole Pattern
<b>Size</b>	Adjustable Spring Size 1-6, includes Patented Green Dial
<b>Warranty</b>	30 years

<b>Cover</b>	<ul style="list-style-type: none"> <li>■ Plastic, Standard</li> <li>■ Metal, Optional</li> </ul>
<b>Fasteners</b>	Self Reaming and Tapping Screws (SRT)
<b>Mounting</b>	Hinge (Pull Side), Top Jamb (Push Side), Parallel Arm (Push Side)
<b>Arms</b>	Regular Arm
<b>Finishes/Colors/Powder Coat</b>	<ul style="list-style-type: none"> <li>■ Aluminum (689)</li> <li>■ Statuary Bronze (690)</li> <li>■ Light Bronze (691)</li> <li>■ Black (693)</li> <li>■ Dark Bronze (695)</li> <li>■ Brass (696)</li> <li>■ Custom colors optional</li> </ul>
	<ul style="list-style-type: none"> <li>■ Optional SRI primer - powder coat only</li> <li>■ Optional plated finishes</li> </ul>

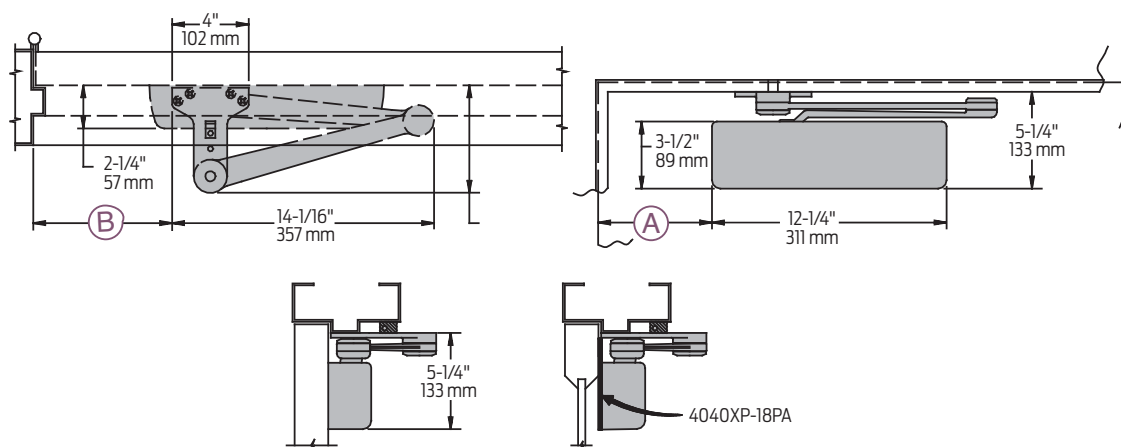
**Special Templates** | Customized installation templates or products may be available to solve unusual applications. Contact LCN Product Support for assistance.



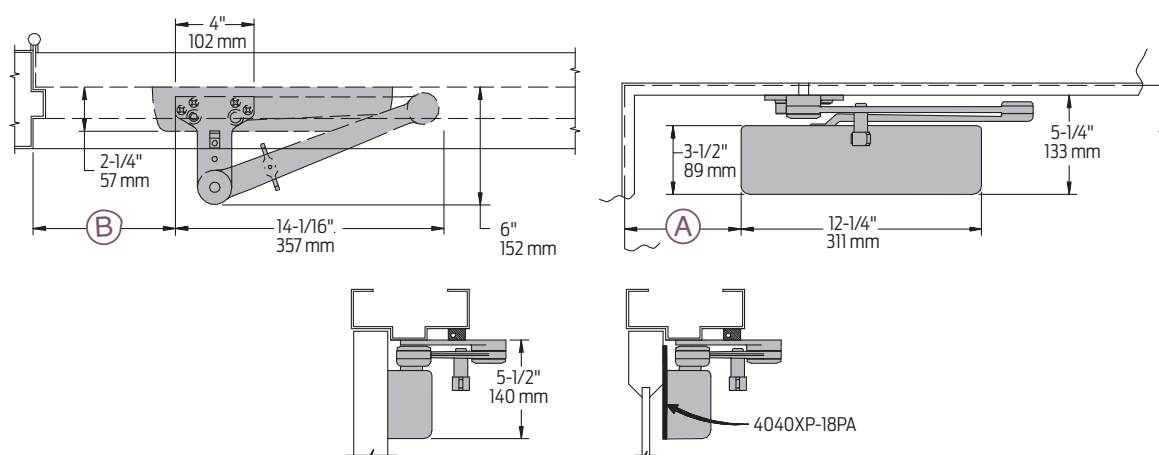
● AVAILABLE  
○ NOT AVAILABLE

♿ Closer available with less than 5.0 lbs. opening force on 36" door.  
\* Maximum opening/hold-open point with standard template.  
\*\* Advanced Variable Backcheck.  
\*\*\* Delay feature incorporates standard 4040 cylinder (not XP).

**EDA mount**



**CUSH mount**



<b>Clearance</b>	4040XP-62EDA is 5-1/2" (140 mm) from door face. 6" (152 mm) for CUSH	
<b>Head Frame</b>	Flush or rabbeted requires CUSH FLUSH PANEL ADAPTER, 4040XP-419	
<b>CUSH ARM</b>	Requires SHOE SUPPORT, 4040XP-30 for fifth screw anchorage for narrow frames	
<b>Delayed Action</b>	<ul style="list-style-type: none"> <li>■ Incorporates standard 4041 cylinder, without XP cylinder.</li> <li>■ Delays closing from maximum opening to ; 115° with 180° template, 95° with 110° template, 85° with 100° template, 75° with 90° template. Delay time adjustable up to approximately 1 minute.</li> </ul>	
<b>Maximum Opening</b>	EDA arm can be templated for points at:	CUSH arms can be templated for opening/hold-open point at:
	110°: A = 6-3/8" (162 mm) B = 7-3/4" (197 mm)	85°: A = 7-15/16" (202 mm) B = 9-1/8" (232 mm)
	or 180°: A = 2-7/8" (73 mm) B = 4-1/4" (108 mm)	90°: A = 7-3/16" (183 mm) B = 8-1/2" (216 mm)
	Hold-open points up to maximum opening with HEDA arm	100°: A = 6-1/16" (154 mm) B = 7-1/4" (184 mm)
		or 110°: A = 5-1/16" (129 mm) B = 6-3/8" (162 mm)

**Notes:**

- 4040XP Series closers ordered with EDA or CUSH arms include 4040XP-201 FIFTH HOLE SPACER to support the shoe
- Spring Cush stop points are approximately 5° more than templated stop point
- Hold open at templated stop points

**Arms**



**4040XP-3077 Regular Arm**

- Non-handed
- Mounts pull side or top jamb with shallow reveal P4041 closer includes PA SHOE, 4040XP-62PA required for parallel arm mounting



**4040XP-3077L Long Arm**

- Non-handed
- Includes LONG ROD AND SHOE, 4040XP-79LR for top jamb mount
- Optional



**4040XP-3077ELR Extra Long Arm**

- Non-handed
- Includes EXTRA LONG ROD AND SHOE, 4040XP-79ELR for top jamb mount with deep reveal
- Optional



**4040XP-3049 Hold-Open Arm**

- Non-handed
- Mounts pull side or top jamb with shallow reveal, hold-open adjustable shoe
- 4040XP closer includes 4040XP-62PA shoe required for parallel arm mounting
- Optional



**4040XP-3049L Long Hold-Open Arm**

- Non-handed
- Includes LONG HEAD AND TUBE, 4040XP-3048L for top jamb mount
- Optional



**4040XP-3077EDA Extra Duty Arm**

- Non-handed
- Features forged, solid steel main and forearm for potentially abusive installations
- Optional



**4040XP-3049EDA Hold-Open Extra Duty Arm**

- Handed
- Parallel arm features forged, solid steel main and forearm for potentially abusive installations
- Hold-open function is adjusted at the shoe
- Optional



**4040XP-3077EDA/62G Extra Duty Arm with 62G**

- Non-handed
- Features forged, solid steel main and forearm for potentially abusive installations
- 62G shoe provides additional blade stop clearance
- Optional



**4040XP-3049EDA/62G Hold-Open Extra Duty Arm with 62G**

- Handed
- Features forged, solid steel main and forearm for potentially abusive installations
- 62G shoe provides additional blade stop clearance. Hold-open function is adjusted at the shoe
- Optional



**4040XP-3077CNS Cush-N-Stop® Arm**

- Non-handed
- Features solid forged steel main arm and forearm with stop in soffit shoe.
- Optional



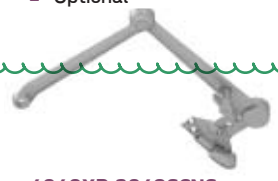
**4040XP-3049CNS HCUSH Arm**

- Non-handed
- Hold-open function with templated stop/hold-open points
- Handle controls hold-open function
- Optional



**4040XP-3077SCNS Spring CUSH Arm**

- Non-handed
- For abusive applications features solid forged steel main arm and forearm with spring loaded stop in the soffit shoe
- Optional



**4040XP-3049SCNS Spring HCUSH Arm**

- Non-handed
- For abusive applications features solid forged steel main arm and forearm with spring loaded stop in the soffit shoe
- Handle controls hold-open function
- Optional



**How-to-order 4040XP Series closers**

- 1. Select finish**
- Standard Powder Coat \_\_\_\_\_  
Aluminum, Dark Bronze, Statuary,  
Light Bronze, Black, Brass.

**Closer will be shipped with:**

- Standard cylinder
- Standard cover
- Regular arm
- Self-reaming and tapping screws  
unless options listed below are selected.

**Closer options**

- Cylinder**
- Delayed Action (4041 DEL)
- Cover**
- Metal (specify right or left hand) (MC)
- Finish**
- Custom Powder Coat (RAL) \_\_\_\_\_  
(handed metal cover required)
  - Plated Finish, US \_\_\_\_\_  
(handed metal cover required)
  - SRI primer (use with powder coat finishes only)

- Arm**
- Regular (REG)
  - Regular w/62PA (Rw/PA)
  - Regular w/62A (R/62A)
  - Long (LONG)
  - Extra Long (XLONG)
  - Hold-Open (H)
  - Hold-Open w/62PA (Hw/PA)
  - Long Hold-Open (HLONG)
  - Extra Duty Arm (EDA)
  - Extra Duty Arm with 62G (EDA/62G)
  - Hold Open Extra Duty Arm (HEDA)  
(Handed)
  - Hold Open Extra Duty Arm with 62  
(HEDA/62G)(Handed)
  - Cush-N-Stop (CUSH)
  - HCush-N-Stop (HCUSH)
  - Spring Cush (SCUSH)
  - Spring HCush (SHCUSH)

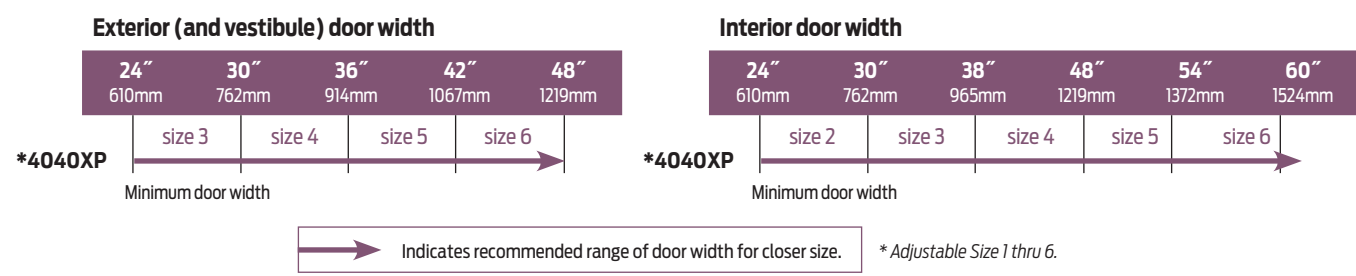
- Optional Screw Packs**
- TB\* w/Self-Reaming and Tapping (TBSRT)
  - Wood & Machine Screw (WMS)
  - TB\*, Wood & Machine Screw (TBWMS)
  - TORX Machine Screw (TORX)
  - TB\* & TORX Machine Screw (TBTRX)  
\* Specify door thickness if other than  
1-3/4".

- Installation Accessories**
- Plate, 4040XP-18
  - Plate, 4040XP-18TJ
  - Plate, 4040XP-18G
  - Plate, 4040XP-18PA
  - CUSH Shoe Support, 4040XP-30
  - Blade Stop Spacer, 4040XP-61
  - Auxiliary Shoe, 4040XP-62A
  - PA Flush Panel Adapter, 4040XP-419

- Special Template**
- ST- \_\_\_\_\_

**Table of sizes**

- 4040XP cylinders are adjustable from size 1 through size 6 and is shipped set to size 3
- Closing power of 4040XP Series closers may be adjusted 50%



**Reduced opening force 4040XP Series closers**

**CAUTION!** Any manual door closer, including those certified by BHMA to conform to ANSI Standard A156.4, that is selected, installed and adjusted based on ADA or other reduced opening force requirements may not provide sufficient power to reliably close and latch a door.

Refer to POWER OPERATORS section for information on systems that meet reduced opening force requirements without effecting closing power.

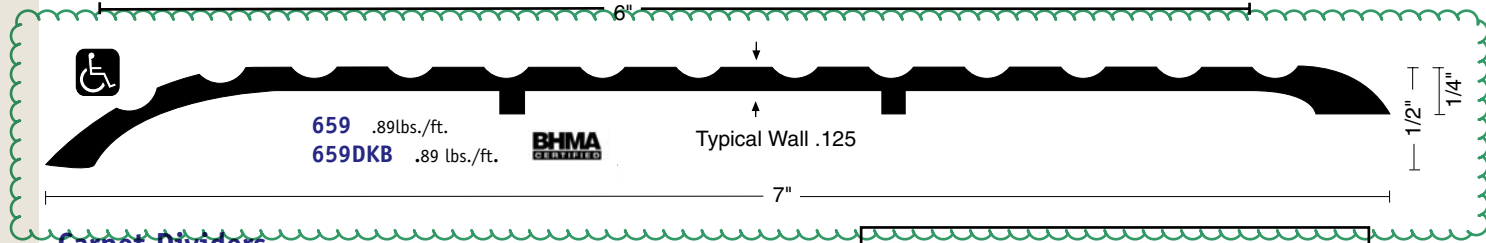
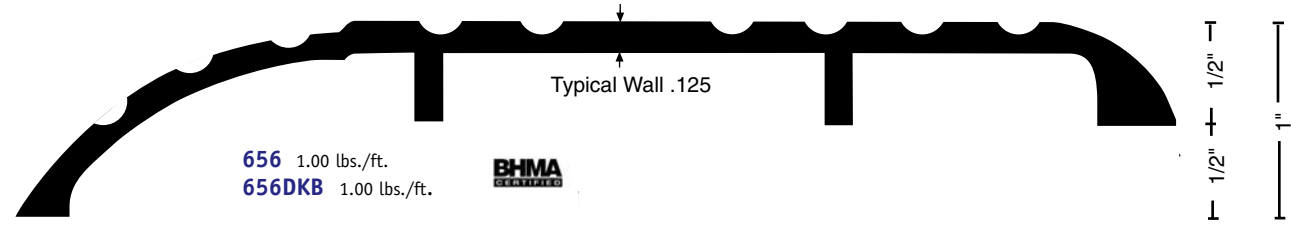
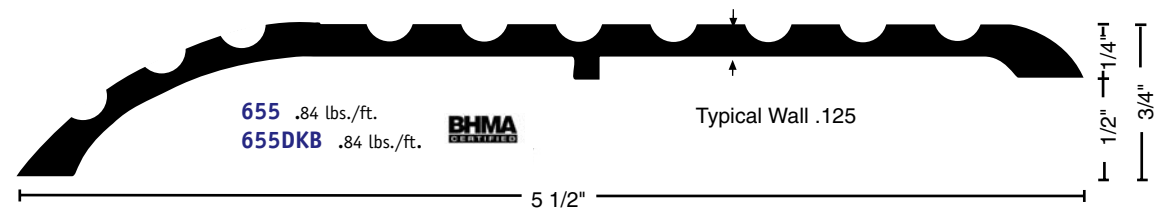
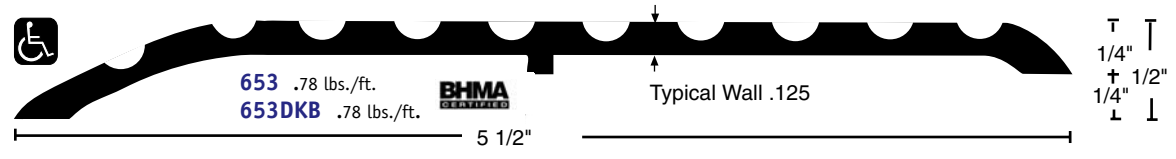
DOOR WIDTH	36"	42"	48"
	8.5* lbs.	4040XP	4040XP
5.0* lbs.	4040XP	4040XP	4040XP

\* Maximum opening force.



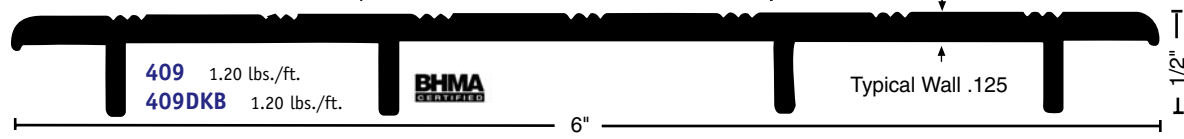
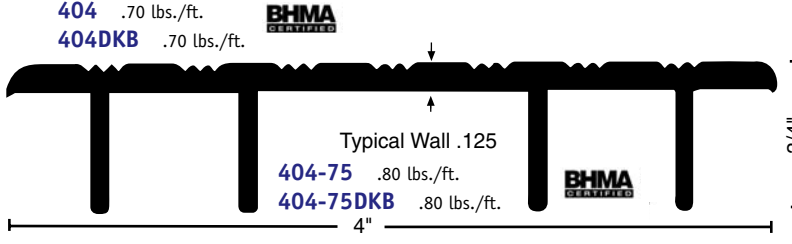
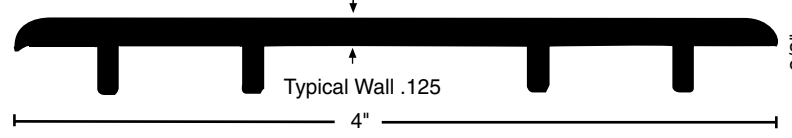
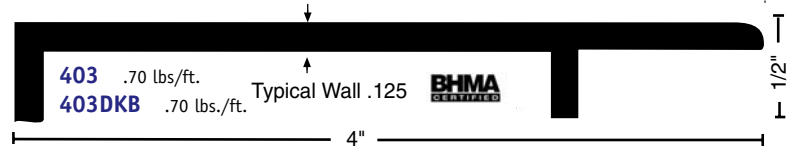
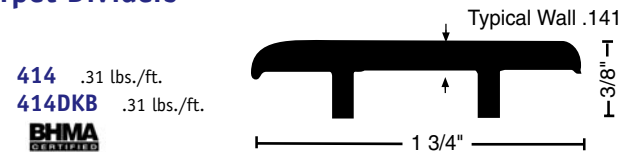
**Offset Thresholds**

All products this page.

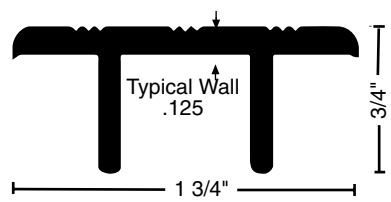
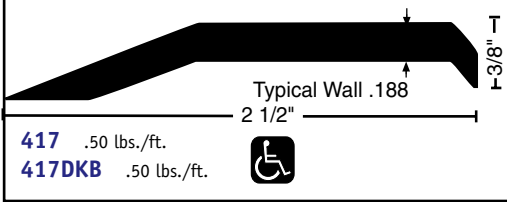
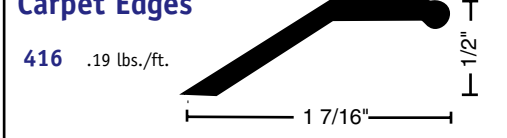


**Carpet Dividers/Carpet Edges**

**Carpet Dividers**



**Carpet Edges**





**SCHLAGE**

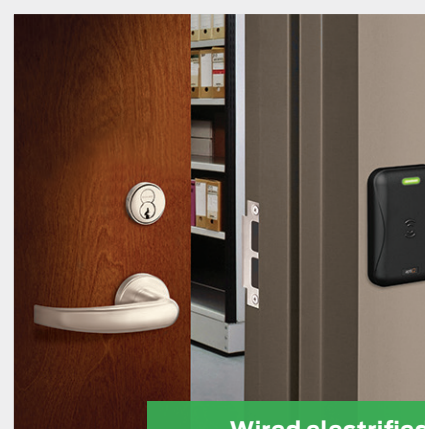
# L Series

Grade 1 mortise locks

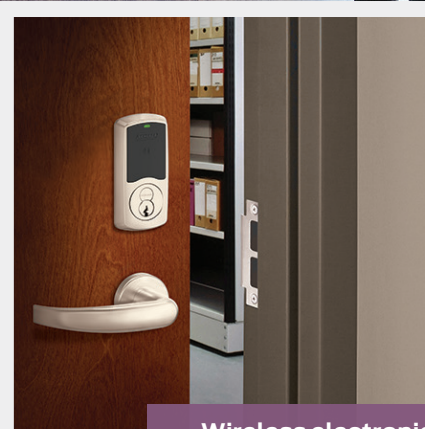
- Mechanical
- Wired electrified
- Wireless electronic
- Multi-point



Mechanical



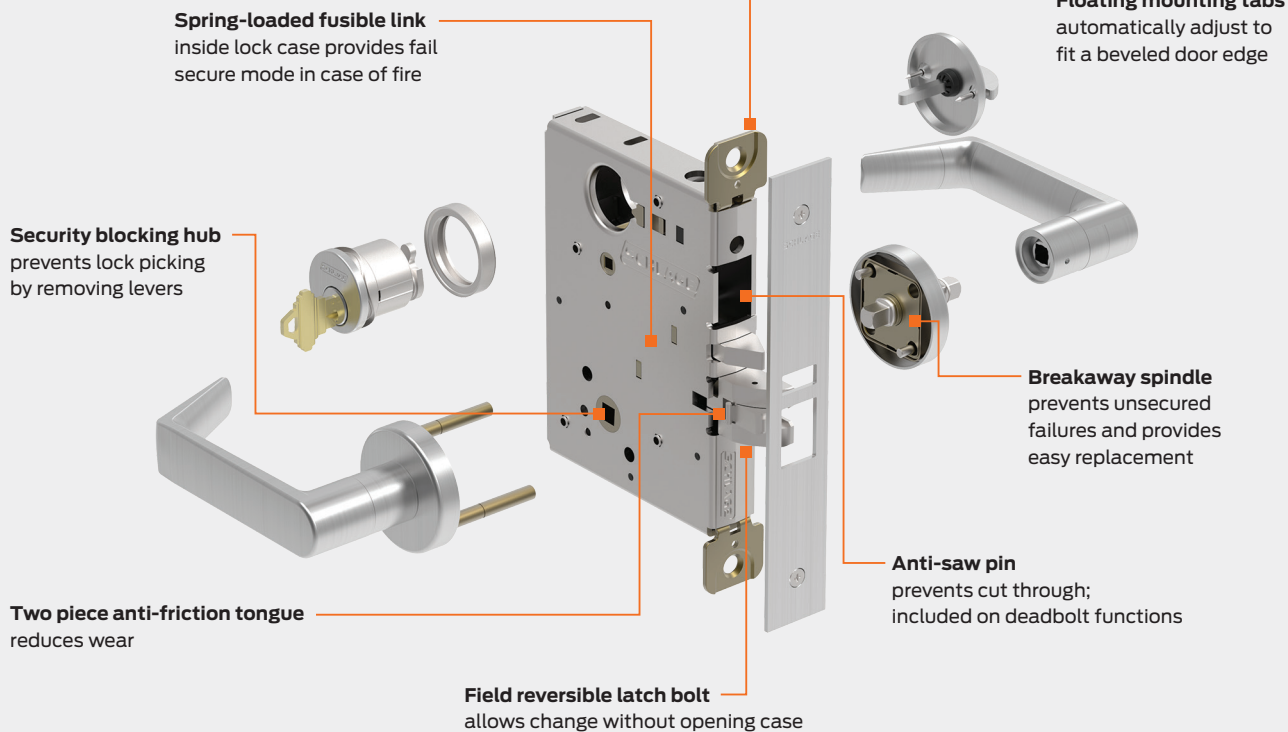
Wired electrified



Wireless electronic

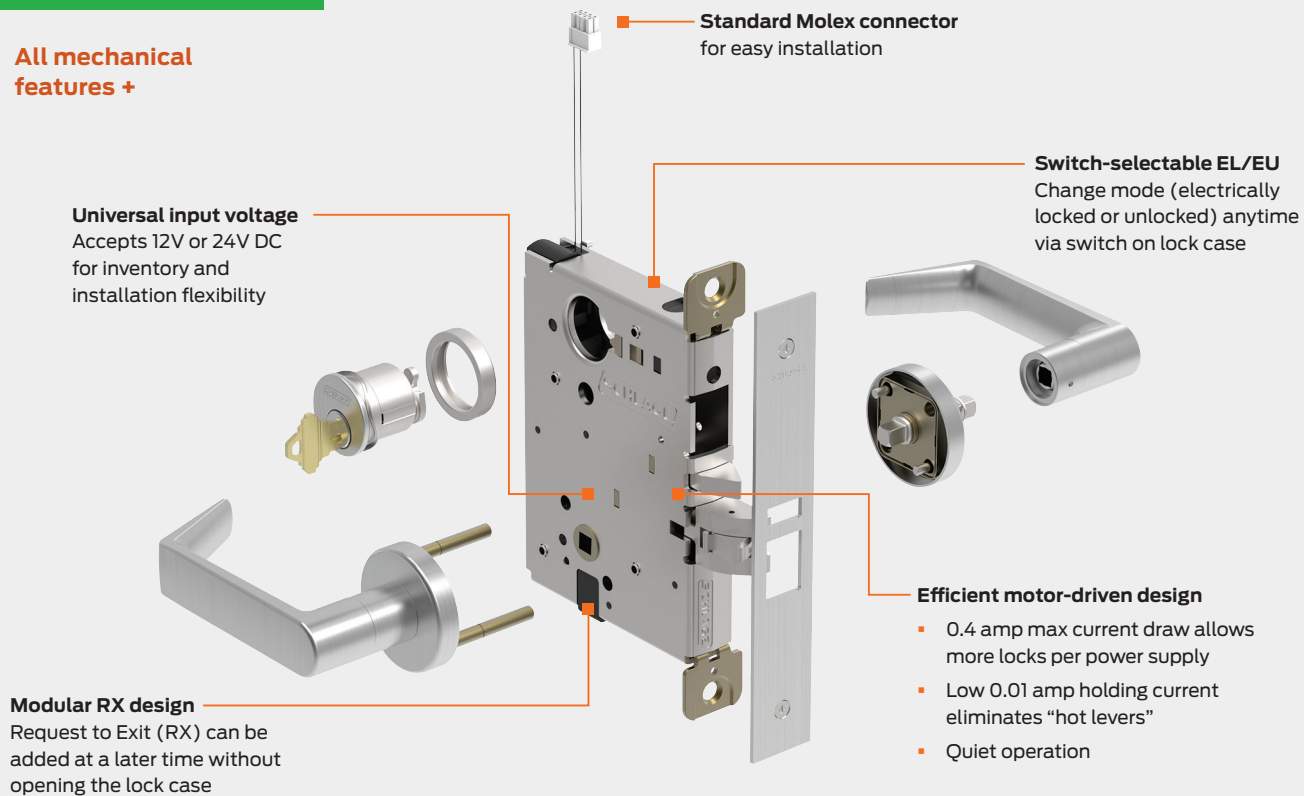
A detailed look...

L mechanical



L wired electrified

All mechanical features +




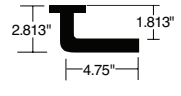

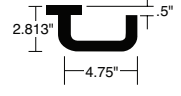

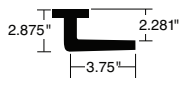



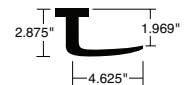

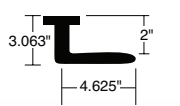

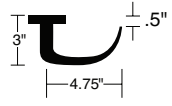

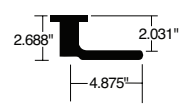

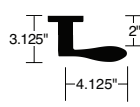

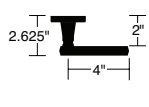






Designs and finishes

The Standard Collection

The Standard Collection levers can be paired with exit devices and locks from our trusted Schlage and Von Duprin brands. And, they are built to the same exacting standards. Our Standard Collection levers offer a more traditional style that is appropriate for use in a number of commercial applications.

<p><b>01</b> ♿</p> 	 <p>2.688" 2.063" 3.875"</p>	<p><b>02</b> ♿</p> 	 <p>2.813" 1.813" 4.75"</p>	<p><b>03</b> ♿</p> 	 <p>2.813" 1.5" 4.75"</p>
<p><b>05</b> ♿</p> 	 <p>2.875" 2.281" 3.75"</p>	<p><b>06</b> ♿</p> 	 <p>2.5" 1.5" 4.625"</p>	<p><b>07</b> ♿</p> 	 <p>2.875" 1.969" 4.625"</p>
<p><b>12</b> ♿</p> 	 <p>3.063" 2" 4.625"</p>	<p><b>17</b> ♿</p> 	 <p>3" 1.5" 4.75"</p>	<p><b>18</b> ♿</p> 	 <p>2.688" 2.031" 4.875"</p>
<p><b>Accent</b> ♿</p> 	 <p>3.125" 2" 4.125"</p>	<p><b>Asti</b> ♿</p> 	 <p>2.625" 2" 4"</p>	<p><b>Latitude</b> ♿</p> 	 <p>2.563" 2" 4.75"</p>

Note: Levers shown with Schlage L Series mortise "A" rose. Knobs shown with rose that is unavailable in the L Series. Additional rose and escutcheon designs available.

Trim and special accessories

## Escutcheons and roses

Three escutcheons and five roses are available to help to match the design and performance needed for your application.

### Escutcheons



**L full face**

Specify by adding 'L' after lever design.  
**Material:** Cold-forged brass, bronze or stainless steel  
**Finishes:** 605, 606, 609, 612, 613, 619, 622, 625, 626, 629, 630, 643e  
**Size:** 8" x 1 3/4" x 7/16" (203 mm x 44 mm x 11 mm)



**L concealed**

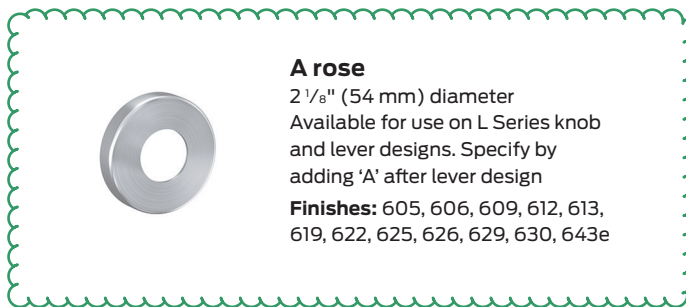
Specify by adding 'C' suffix to function and by adding 'L' after lever design.  
**Material:** Cold-forged brass, bronze or stainless steel  
**Finishes:** 605, 606, 609, 612, 613, 619, 622, 625, 626, 629, 630, 643e  
**Size:** 8" x 1 3/4" x 7/16" (203 mm x 44 mm x 11 mm)



**N full face**

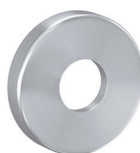
Specify by adding 'N' after lever design.  
**Material:** Heavy wrought reinforced brass, bronze or stainless steel  
**Finishes:** 605, 606, 609, 612, 613, 619, 622, 625, 626, 629, 630, 643e  
**Size:** 8" x 2 9/16" x 7/16" (203 mm x 65 mm x 11 mm)

### Roses



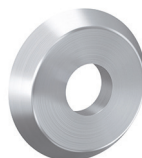
**A rose**

2 1/8" (54 mm) diameter  
 Available for use on L Series knob and lever designs. Specify by adding 'A' after lever design  
**Finishes:** 605, 606, 609, 612, 613, 619, 622, 625, 626, 629, 630, 643e



**B rose**

2 9/16" (65 mm) diameter  
 Available for use on L Series knob and lever designs. Specify by adding 'B' after lever design.  
**Finishes:** 605, 606, 609, 612, 613, 619, 622, 625, 626, 629, 630, 643e



**C rose**

2 5/8" (66 mm) diameter  
 Available for use on L Series knob and lever designs. Specify by adding 'C' after lever design.  
**Finishes:** 605, 606, 609, 619, 622, 625, 626, 629, 630, 643e



**AVA rose**

2 5/8" (66 mm) diameter  
 Available for use on ACC lever, other levers upon request.  
**Finishes:** 605, 606, 609, 619, 622, 625, 626, 643e



**MER rose**


2 5/8" (66 mm) diameter  
 Available for use on MER lever, other levers upon request.  
**Finishes:** 605, 606, 609, 619, 622, 625, 626, 643e

**Trim and special accessories**


**Thumbturns and indicators**

Choose from these variations of thumbturn locks that help you meet the demands of specialized projects.


**Thumbturns**




**Standard turn**  
09-509




**ADA turn**  
09-509 x L583-363  
Available with all thumbturn-function L Series locks except L9463 and L463




**Coin turn**  
L283-124  
For lock functions L9044 and L9444 with rose trim.



**Emergency button**  
K510-330  
For lock functions L9040 and L9440



**Ligature resistant turn**  
09-029



**Cylinder turn**  
09-90x  
For L463 and L9463 classroom function deadlocks

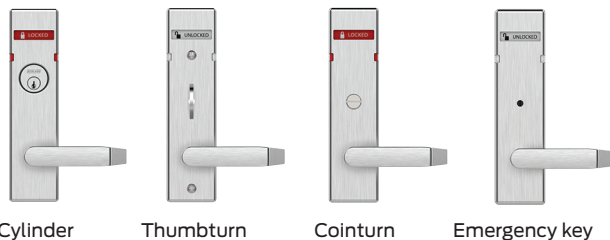
*Annotations:*  
 - Green box: "this design not accessible" points to the ADA turn lock.  
 - Green box: "include 'XB11-720' for accessible version" points to the Cylinder turn lock.

**Indicators**

The 180 degree visibility indicator offers unparalleled visibility and flexibility. The unique features of the indicator make it ideally suited for classroom security applications as well as traditional occupied/vacant applications.

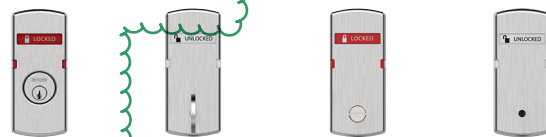
- 2" x 1/2" display for easy viewing at a distance
- 180° window for visibility at any angle
- High-mount placement for quick assessment
- High contrast colors for ease of reading
- Available for over 30 functions, inside or outside of door (see Functions section for availability)
- Retrofit kit allows indicator upgrades to already installed L Series mortise locks
- Indicator text available in English or French

**N escutcheon indicators**



Cylinder    Thumbturn    Cointurn    Emergency key

**Sectional indicators**



Cylinder    Thumbturn    Cointurn    Emergency key

LOCKED	OCCUPIED	DO NOT DISTURB	LOCKED
UNLOCKED	VACANT		UNLOCKED

Inside trim	L283-711	L283-712	L283-713	L283-714
Outside trim	L283-721	L283-722	L283-723	L283-724

**Legacy indicator**

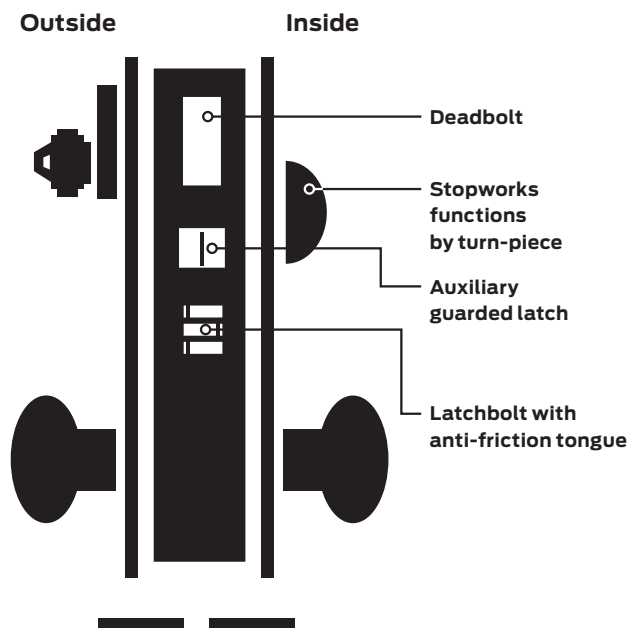


**Hotel occupancy indicator**  
09-611

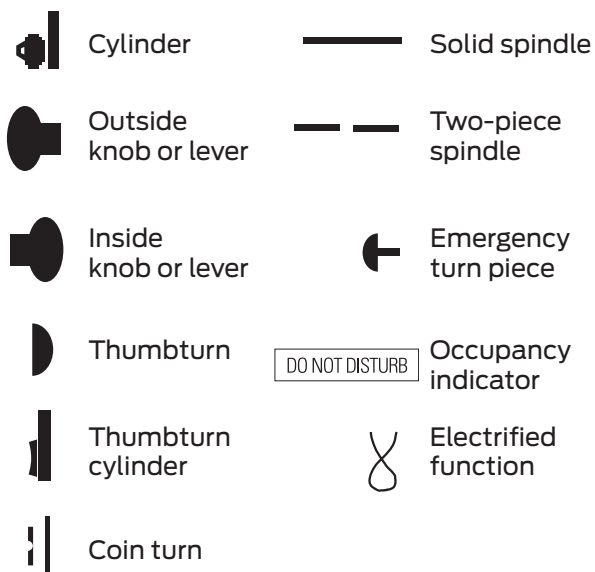
For lock function L9486P, used with A or B roses on section trim. Three available messages: "OCCUPIED", "DO NOT DISTURB" or "LOCKED".

## L Series mechanical lock functions

### Legend



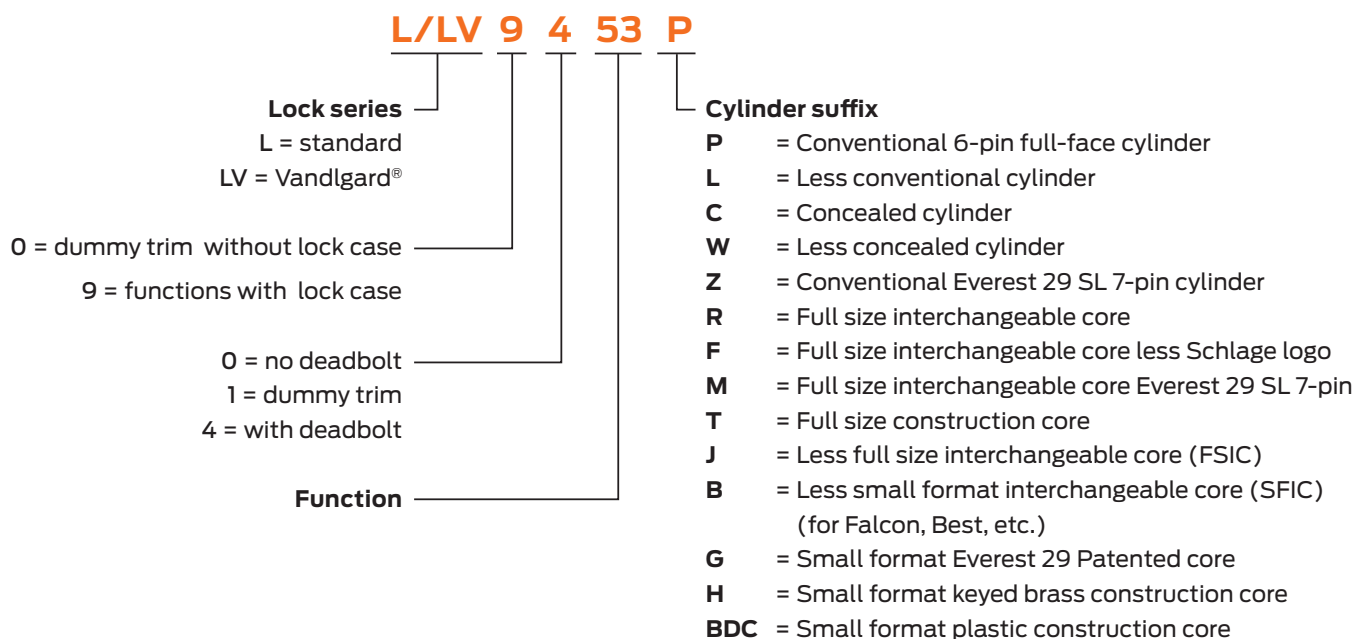
### Key



**LV** Vandlgard function allows exterior lever to rotate freely down, while remaining securely locked.













180 degree messaging indicator available. See options section in price book for details.

### Product identification guide



L Series mechanical lock functions

Double cylinder non-deadbolt functions

Schlage	ANSI	Schlage	ANSI	Schlage	ANSI	Schlage	ANSI
<b>L9060</b> <b>LV9060</b>	<b>F09</b>	<b>L9071</b> <b>LV9071</b>	<b>F32</b>	<b>L9077</b> <b>LV9077</b>	—	<b>L9082</b> <b>LV9082</b>	<b>F30</b>
<b>Apartment entrance lock</b>		<b>Classroom security lock</b>		<b>Classroom security holdback lock</b>		<b>Institution lock*</b>	
<ul style="list-style-type: none"> <li>· Latchbolt retracted by knob/lever from either side unless outside is locked by key from inside</li> <li>· When locked, latchbolt retracted by outside key or inside knob/lever</li> <li>· Auxiliary latch deadlocks latchbolt when door is closed</li> <li>· Inside lever always free for immediate egress</li> </ul>		<ul style="list-style-type: none"> <li>· Latchbolt retracted by knob/lever from either side unless outside is locked by key from either side</li> <li>· When locked, latchbolt retracted by outside key or inside knob/lever</li> <li>· Auxiliary latch deadlocks latchbolt when door is closed</li> <li>· Inside lever always free for immediate egress</li> </ul>		<ul style="list-style-type: none"> <li>· Latchbolt retracted by knob/lever from either side unless outside is locked by key from either side</li> <li>· When locked, latchbolt retracted by outside key or inside knob/lever</li> <li>· Auxiliary latch deadlocks latchbolt when door is closed</li> <li>· Rotate inside lever/knob and turn key 360° to enable holdback feature</li> <li>· Inside lever always free for immediate egress</li> </ul>		<ul style="list-style-type: none"> <li>· Latchbolt retracted by key from either side</li> <li>· Knob/lever on both sides always inoperative</li> <li>· Auxiliary latch deadlocks latchbolt when door is closed</li> </ul>	
							
<b>Double cylinder deadbolt functions</b>		Schlage	ANSI	Schlage	ANSI	Schlage	ANSI
		<b>L9457</b> <b>LV9457</b>	<b>F33</b>	<b>L9458</b> <b>LV9458</b>	<b>F34</b>	<b>L9466</b>	<b>F14</b>
		<b>Classroom security lock with deadbolt</b>		<b>Classroom security lock w/ deadbolt and auxiliary latch</b>		<b>Store/utility room lock with deadbolt*</b>	
		<ul style="list-style-type: none"> <li>· Latchbolt retracted by lever/knob from either side</li> <li>· Deadbolt actuated by either key</li> <li>· Throwing deadbolt locks outside lever/knob</li> <li>· Actuating inside lever/knob retracts both deadbolt and latchbolt and unlocks outside lever</li> <li>· Inside lever always free for immediate egress</li> </ul>		<ul style="list-style-type: none"> <li>· Latchbolt retracted by knob/lever from either side</li> <li>· Deadbolt actuated by either key</li> <li>· When door is locked outside lever inoperative</li> <li>· Inside lever retracts deadbolt and latchbolt and unlocks outside lever</li> <li>· Auxiliary latch deadlocks latchbolt when door is closed</li> <li>· Inside lever always free for immediate egress</li> </ul>		<ul style="list-style-type: none"> <li>· Latchbolt retracted by knob/lever from either side</li> <li>· Deadbolt actuated by either key</li> </ul>	
							

\* **Caution:** Double cylinder locks on residences and any door in any structure which is used for egress are a life safety hazard in times of emergency and their use is not recommended. Installation should be in accordance with existing codes only.

## Cylinders and key systems

# Cylinders and key systems

A strong lock is only part of the security solution—proper key control is equally important. Schlage offers extensive options to meet the security needs of the specific project.

### Cylinders



#### Conventional mortise cylinder options<sup>1</sup>

- 6-pin length (standard)
- 7-pin length in SL cylinder
- Available in Schlage Classic and Everest 29™ open and restricted keyways
- Primus® XP security features and geographic exclusivity
- Primus XP UL 437 listed high security features
- Faculty restroom function available



#### Full size interchangeable core (FSIC) options<sup>1</sup>

- 6-pin length
- 7-pin length in SL cylinder
- Available in Schlage Classic and Everest 29 open and restricted keyways
- Interchangeable core compatible with conventional cylinder key systems
- Primus XP security features and geographic exclusivity



#### Small format interchangeable core (SFIC) options<sup>2</sup>

- 7-pin combined Everest 29 R restricted keyways<sup>3</sup>

Available in 606, 622, 626 and 643 plug face finishes; Everest 29 S123 keyway standard. Available 606, 622, 626 and 643e finish only. Restricted keyway cores require authorization from the end user.

### Key systems

#### Classic keyway

- Open keyway—keys are duplicated and available without ordering formalities
- Upgradeable to Primus XP and UL 437 levels of security

#### Everest 29

- Patented through 2029
- Key duplication is restricted providing a higher level of security for the cylinder
- Can be integrated to an existing Everest B, C, or D system
- Upgradeable to Primus XP and UL 437 levels of security

### Cylinder mechanism options

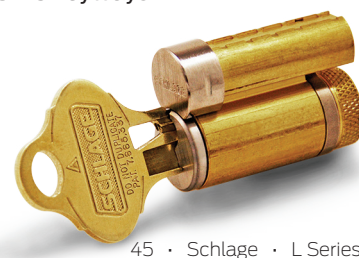
#### Primus XP

- Independent, dual locking mechanisms
- Unique side bit milling on key makes unauthorized duplication highly enforceable
- Allows creation of geographically exclusive keys in thousands of available combinations
- Provides patent protection when applied to Schlage Classic keyways
- Compatible to all Everest and Everest 29 keyways

Key system type: to be determined in keying conference

#### Everest 29 SL

- Available in Conventional and FSIC cylinder formats
- Pinned on an A2 system compatible with the Schlage Everest B and Everest 29 R keyways
- Users can expand existing Everest B and Everest 29 R key systems
- Enables Primus XP upgrades on SFIC keyways



45 · Schlage · L Series

Overview  
Key features  
Trims and finishes  
Mechanical  
Wired electrified  
Wireless electronic  
Multi-point  
Key systems and credentials  
Parts  
Ordering and specifications

Cylinders and key systems

Key system type: to be determined in keying conference

Administrative Security		Schlage Everest 29™				
Primus® XP geographically exclusive side bit milling options	Schlage Classic	End user exclusive nationwide	4N		9N	
		End user exclusive within time zone/country	4Z		9Z	
		End user exclusive within zip code	3G	9G		
		End user controlled; non-exclusive	3U	9U		
		Dealer exclusive within time zone/country	2	8		
		Dealer exclusive within zip code	1+	7		
		Authorized dealer only; non-exclusive	1			

Mechanical		Physical Security	
End user controlled; non-exclusive	Authorized dealer only	Primus XP RESTRICTED Schlage Classic FSIC and Conventional	Primus XP RESTRICTED Schlage Everest 29 R FSIC <sup>2</sup> and Conventional <sup>2</sup> Schlage Everest 29 S FSIC and Conventional Schlage Everest 29 T FSIC and Conventional
No authorization	OPEN Schlage Everest 29 S FSIC and Conventional	RESTRICTED Schlage Everest 29 R <sup>1</sup> SFIC, FSIC <sup>2</sup> and Conventional <sup>2</sup> Schlage Everest 29 T FSIC and Conventional	UL 437 Option UL listed security improvements available with Primus XP
<ul style="list-style-type: none"> <li>Duplicate anywhere</li> </ul>	<ul style="list-style-type: none"> <li>Patented design</li> <li>Check pin in cylinder</li> </ul>	<ul style="list-style-type: none"> <li>Requires letter of authorization</li> <li>Patented design</li> <li>Check pin in cylinder</li> </ul>	<ul style="list-style-type: none"> <li>Hardened steel drill pins</li> <li>Proven pick and drill resistant</li> <li>Withstands extreme physical attack</li> </ul>

COMPARABLE ELECTRONIC SECURITY - Ensure your credential is as secure as your keyway		
Proximity credentials	MIFARE Classic® smart credentials	MIFARE Plus® and MIFARE® DESFire® EV1 smart credentials
<ul style="list-style-type: none"> <li>Easily duplicated</li> </ul>	<ul style="list-style-type: none"> <li>Secure encrypted data and communications</li> <li>Difficult to duplicate</li> </ul>	<ul style="list-style-type: none"> <li>Advanced data encryption makes duplication nearly impossible</li> <li>Most secure credentials available from Schlage</li> </ul>

1. Limited dealer controlled programs available.  
2. FSIC and Conventional in the form of SL cylinders that accept an SFIC key.

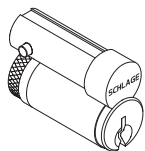
## Primus XP access control and high security cylinders

Primus XP access control and high security cylinders are available to add patented key control and varying degrees of geographical exclusivity to most Schlage 6- and 7-pin key systems, whether Everest 29 or Classic keyways.

In addition to a standard pin tumbler mechanism, Primus cylinders incorporate a patented finger pin and sidebar design, providing a “dual-locking” cylinder that is virtually pick-proof. Resistance to drilling and other physical attack is optional by specifying 20-500 Series UL 437 Listed high security cylinders.

Classic Primus XP cylinders are recommended for upgrading existing Classic key systems. Due to its extended patent life, Everest 29 Primus XP is recommended for new key systems and for upgrading existing Everest key systems. Specify keyway to differentiate between Everest 29 and Classic. Example: C or CP (Classic) vs. S123 (Everest 29).

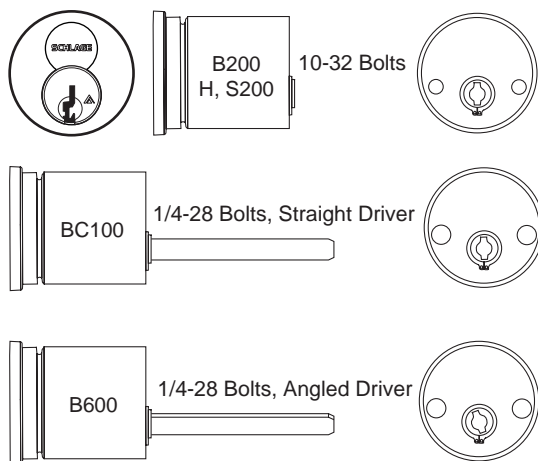
## Full Size Interchangeable Core Cylinders for Schlage Locksets



### Full Size Core Only

Number	Mechanism
23-030	Conventional core
30-120	Conventional core for hotel function (specify hand)
20-740	Primus core (not available in hotel function)

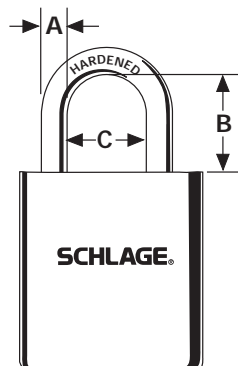
Available 606 and 626 finish only. Everest C123 keyway standard. Order control keys separately.



### Full Size IC Housings for Bored Deadlocks, Less Core

Lockset Series	Description	Number	Specify Finish
BC100-Series	Outside	B220-203	605, 609, 612, 613, 625, 626
	Inside	B220-204	See Note Below
B250, H, S200-Series	Outside	22-061	605, 606, 609, 610, 611, 612, 613, 616, 625, 626
	Inside of B252	22-062	
B600 / 700-Series	Outside	B610-027	605, 606, 609, 612, 613, 625, 626
	Inside	B610-028	See Note Below

Specify finish of B610-031 inside snap-on faceplate ordered separately for BC162 and B662/762.



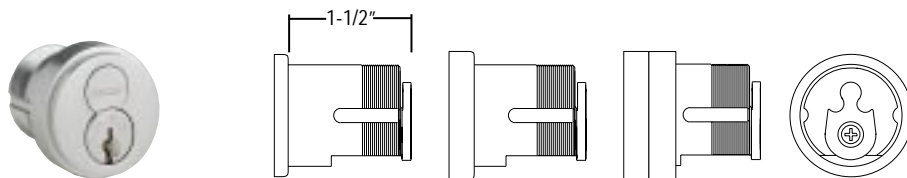
### Interchangeable Core Padlocks

Padlock Series	Shackle Dimensions			Padlock with Core	
	A	B	C	Conventional	Primus
PL4000 2" x 2 1/4" x 7/8"	3/8"	1 1/8"	3/4"	PL4001	PL4741
	3/8"	2"	3/4"	PL4002	PL4742
	3/8"	3"	3/4"	PL4003	PL4743


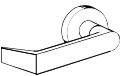


# CYLINDERS, KEYS AND KEY CONTROL

## Full Size Interchangeable Core Mortise Cylinders



Cylinders for Schlage L-Series Mortise Locks

Design	Function	Core Mechanism		
		Conventional	Primus	Housing Less Core
 <p><b>L &amp; N Escutcheons</b> (cylinders with compression ring)</p>	All Except Below	30-008	20-798	30-007
	L9060P Outside	30-030	20-782	30-032 + 36-083
	L9485P, L9486P Hotel Functions	30-010*	N/A	30-007
 <p><b>Sectional Trim</b> (cylinder with compression ring, spring and 3/8" blocking ring)</p>	All Except Below	30-138	20-776	30-137
	L9060P Outside	20-061	20-783	30-032 + 36-083 + 35-082-037
	L9485P, L9486P Hotel Functions	30-140*	N/A	30-137

\* Hotel function cores are handed. Specify hand of door.



**L583-255**  
Cam for All Functions  
Except L9060 Outside



**K510-680**  
Cam for  
L9060 Outside

### Mortise Cylinders with Straight Cam for Exit Devices and Most Old Black Cast Iron Mortise Locksets

Number	Core Mechanism	Collar
26-091	Conventional core	Compression ring & spring
20-061		3/16" + 3/8" blocking rings
20-763	Primus core	Compression ring & spring
20-771		3/16" + 3/8" blocking rings
20-059	Housing less core	None
26-064		Compression ring & spring
26-094		3/16" + 3/8" blocking rings

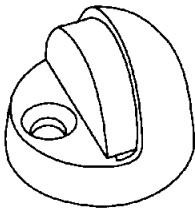


**K510-730**  
Straight Cam,  
Other Applications

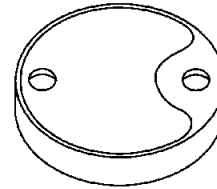
- Notes
1. Available 605, 606, 612, 613, 625, and 626 finish. Cores furnished 606 and 626 only.
  2. To differentiate between Classic and Everest, specify keyway. Example: C or CP (Classic), C123 (Everest). Everest C123 keyway standard.
  3. All cylinders are 1-1/2" long.
  4. Specify LKB if 0-bitted Primus cylinders are required less key blanks.



## STOPS AND RISERS



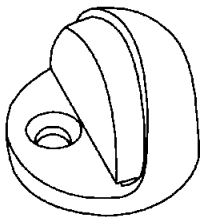
TRIMCO#	1212	W1212
R	1/2"	1/2"
B	1-3/4 x 2"	1-3/4 x 2"
H	1-1/4"	1-1/4"
M	Cast	Wrought
BHMA	LO2161	LO2161
	Br, Bz, Pl	Br, Bz, SS
		Patent #4,209,876



TRIMCO#	1210AR
D	1-3/4"
H	15/32"
	Br, Bz, Pl

**Adapter Riser -**  
To convert cast Lo-dome stop to High-dome stop.

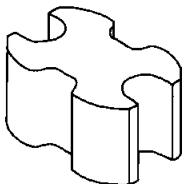
**Dome Stop - Combo Pack.** Only the W1212 and 1212TM are recommended for high abuse applications.



TRIMCO#	1211	<b>NEW</b>
R	7/32"	
B	1-1/2"	
H	1-7/16"	
M	CAST	
BHMA	LO2141/LO2161	
		Br, Bz, Pl

Low-Rise Lip and High-Rise Rubber enable this stop to be used with door openings either with or without threshold. No adapters necessary. May be used with 1210 Carpet Risers (#1210AR), although need for risers is substantially reduced. Patent applied for.

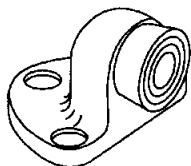
**Universal Dome Stop -**



TRIMCO#	1210CL	W1210CL	1210CH	W1212CH
OA	1 x 1-13/32"	1 x 2-1/16"	1 x 1-13/32"	1 x 2-1/16"
R	1/2"	5/8"	3/4"	5/8"
	Carpet riser for cast dome. Stop 1210.	Riser for W1210	Carpet riser for cast dome. Stops 1210 / 1212.	Riser for W1212

**Carpet Riser -**  
Specify Stop Finish.

AI



TRIMCO#	1214	1214H	<b>1214CK</b>
B	1-3/4 x 2-1/2"	1-3/4 x 2-1/2"	1-3/4 x 2-1/2"
H	1-3/4"	2-1/4"	2-1/4"
BHMA	LO2121		
			Supplied with Torx if mated to 1268CK.

**Door Stop- Cast - Heavy Duty. (3 fasteners)**  
Combo Pack.

Br, Bz, Pl

1214CK is a heavy duty, high-abuse, school design which reduces tampering and loss of rubber bumper. When mounted to 1268CK requires 3" diameter cored hole in concrete.

## SECTION 085113 - ALUMINUM WINDOWS

## 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: Aluminum windows.

## 1.3 ACCESSIBILITY REQUIREMENTS

- A. Windows: California Building Code (CBC) 11B-229.1.
  - 1. Where glazed openings are provided in accessible rooms or spaces for operation by occupants, at least one shall comply with CBC Section 11B-309.

## 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, recommendations, and standard details for aluminum doors and frames, including independent laboratory certified tests as necessary to demonstrate compliance with specified requirements.
- B. Shop Drawings: Submit shop drawings including plans, elevations, sizes, and complete details for materials, finishes, sizes, profiles, dimensioned locations of hardware items with reinforcement, methods of anchoring, glazing, and caulking.
- C. Samples: Submit Samples of required aluminum finish on 6-inch sections of extruded aluminum.
- D. Delegated-Design and Deferred Submittal: Comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.5 REFERENCES

- A. American Architectural Manufacturers Association (AAMA).
- B. American Society for Testing and Materials (ASTM).
- C. Aluminum Association (AA).
- D. National Wood Window & Door Association (NWWDA).
- E. California Association of Window Manufacturers (CAWM).

## 1.6 SYSTEM DESCRIPTION

- A. General: In addition to requirements shown or specified, comply with applicable provisions of AAMA Windows and Sliding Glass Doors Manual for design, materials, fabrication and installation of component parts.
- B. Structural Loads: As indicated on Drawings.
- C. Seismic Performance: Determined according to ASCE/SEI 7.
- D. Performance Requirements: Each assembly shall be tested by a recognized testing laboratory or agency in accordance with specified test methods.
  - 1. Conformance to F-AW55, C-AW80, AP-AW80 specifications in AAMA/NWWDA 101/I.S. 2/A440-8.
    - a. Air Infiltration: Accordance with ASTM E 283 at a static air pressure difference of 6.24 psf. Air infiltration shall not exceed .30 cfm per square foot.
    - b. Water Resistance: Accordance with ASTM E 331/ASTM E 547 at a static air pressure difference of 12 psf. No water leakage.
    - c. Uniform Load Structural: Aluminum window systems comply with AAMA/WDMA/CSA 101/I.S.2/A440-08, Voluntary specifications for aluminum windows. Guidelines for specified AW rated product.
    - d. Component testing: Accordance with procedures described in AAMA/NWWDA 101/I.S. 2/A440-08.
    - e. Forced Entry Resistance: All windows shall conform to CAWM 301-90.
    - f. Condensation Resistance Test: (CRF) when tested in accordance with AAMA 1503.1-88, the condensation resistance factor shall not be less than 51.
    - g. Thermal Transmittance Test: Accordance with AAMA 1503.1-88, (U-Value) not more than .59 BTU/hr/sf°F.
    - h. Thermal Movements: Allow thermal movement resulting from the following maximum change (range) in ambient temperature.
      - 1) 120 deg F, ambient; 180 deg F, material surfaces.

## 1.7 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain exterior sun control devices, bi-fold doors, entrance, storefront, windows, and finish, through one source from a single manufacturer.
- B. Provide test reports from AAMA accredited laboratories certifying the performances as specified herein.

## 1.8 WARRANTY

- A. Warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Basis-of-Design and Permit Approval: Arcadia T200 Series (thermal).

## 2.2 MATERIALS

- A. Extruded aluminum profiles 6063-T6 alloy and temper (ASTM B221 G.S. 10A-T6).
- B. All framing members .125 minimum wall thickness.
- C. At Casement, Awning, and Hopper windows provide heavy-duty four bar hinges shall be stainless steel only, with asymmetric end caps, and adjustable limit stops. Lock and latches cast white bronze, US-25D finish.
- D. Weatherstrip EPDM bulb type conforming to ASTM D2000 AA515 and shall be keyed into extruded grooves.
- E. Back glazing two-sided adhesive, 15 lbs./ft.<sup>3</sup> density, polyethylene tape. Glazing wedges shall be EPDM or Santoprene.
- F. At operable windows provide screens made of extruded aluminum frame and screened with either 18 x 14 aluminum or fiber mesh.
- G. Thermal barrier material poured-in-place two-part polyurethane.
- H. Glazing:
  - 1. 1-inch Insulating Glass Unit (IGU) with 1/2-inch Airspace and (2) 1/4-inch Lites: Vitro Solarcool (2) Solar Bronze + Clear.
  - 2. Safety Glazing: Where safety glazing is required, provide glazing that complies with 16 CFR 1201, Category II.
- I. Sealant: See Specification 079200 "Joint Sealants."
- J. Finish all exposed areas of aluminum and components as indicated.
  - 1. An Architectural Class I anodic coating conforming with AA-M12C22A31/AA-M12C22A41.
    - a. Anodize finish color shall be Colornodic #11 Clear.

## 2.3 FABRICATION

- A. Frame components mitered, reinforced extruded corner key, hydraulically crimped, and "cold welded."

- B. All ventilator extensions tubular, each corner mitered, reinforced extruded corner key, hydraulically crimped, and “cold welded.”
- C. All corners weather sealed with an elastomeric sealant.

PART 3 - EXECUTION

3.1 EXAMINATIONS

- A. Examine conditions and verify substrate conditions are acceptable for product installation.

3.2 INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturers installation instructions.

3.3 FIELD QUALITY CONTROL

- A. Contractor’s responsibility to make all necessary final adjustments to attain normal operation of each window and its mechanical hardware.

END OF SECTION 085113

## SECTION 096513 - RESILIENT BASE AND ACCESSORIES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Resilient base.
  - 2. Resilient molding accessories.

## 1.3 ACTION SUBMITTALS

- A. Submit product data, shop drawings, and samples per Specification 013000 "Administrative Requirements."
  - 1. Include VOC content.

## 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

## 1.5 QUALITY ASSURANCE

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

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

## 1.7 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 RESILIENT BASE

- A. Products: As indicated on Drawings.
- B. Resilient Base Standard: ASTM F 1861.
  - 1. Material Requirement:
    - a. Thermoset-Rubber Base: Type TS (rubber, vulcanized thermoset).
  - 2. Manufacturing Method: Group I (solid, homogeneous).
- C. Lengths: Coils in manufacturer's standard length.
- D. Outside Corners: Job formed.
- E. Inside Corners: Job formed.
- F. Color(s): As selected by Architect from full range of industry colors.

### 2.2 RESILIENT MOLDING ACCESSORIES

- A. Resilient Molding Accessory:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Armstrong World Industries, Inc.
    - b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
    - c. Flexco, Inc.
    - d. Johnsonite.



- e. Roppe Corporation, USA.
- f. VPI, LLC; Floor Products Division.

B. Description:

- 1. Cap for cove carpet.
- 2. Cap for cove resilient flooring.
- 3. Nosing for carpet.
- 4. Nosing for resilient flooring.
- 5. Reducer strip for resilient flooring.
- 6. Joiner for tile and carpet.
- 7. Transition strips.

C. Material: Rubber.

D. Profile and Dimensions: As indicated.

E. Color(s): As selected by Architect from full range of industry colors.

### 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

### 3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. Job-Formed Corners:
  - 1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
  - 2. Inside Corners: Use straight pieces of maximum lengths possible.

### 3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient flooring that would otherwise be exposed.

### 3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
  - 1. Apply three coat(s).
- E. Cover resilient products until Substantial Completion.

END OF SECTION 096513

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## SECTION 096519 - RESILIENT TILE FLOORING

## 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: Rubber floor tile.
- B. Related Requirements: Section 096513 "Resilient Wall Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient tile flooring.

## 1.3 ACCESSIBILITY REQUIREMENTS

- A. 11B-302.1 General. Floor or ground surfaces shall be stable, firm, and slip resistant and shall comply with Section 11B-302. (California Building Code)

## 1.4 ACTION SUBMITTALS

- A. Submit product data, shop drawings, and samples per Specification 013000 "Administrative Requirements."
  - 1. Include VOC content.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

## 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

## 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

## 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

## 1.10 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

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

### 2.2 RUBBER FLOOR TILE

- A. Products: As indicated on Drawings.
- B. Tile Standard: ASTM F 1344 Standard Specification for Rubber Floor Tile.

- C. Hardness: ASTM D 2240 Standard Test Method for Rubber Property.
  - 1. Durometer Hardness: 65 Shore A.
- D. Seamless-Installation Method: Chemically bonded.

### 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- C. Seamless-Installation Accessories:
  - 1. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
  - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Do not install floor tiles until materials are the same temperature as space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- C. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
  - 1. Chemically Bonded Seams: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.



- D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
  - 1. Apply three coat(s).
- E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- F. Cover floor tile until Substantial Completion.

END OF SECTION 096519

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## SECTION 096813 - TILE CARPETING

## 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: Modular carpet tile.

## 1.3 ACCESSIBILITY REQUIREMENTS

- A. 11B-302.2 Carpet. Carpet or carpet tile shall be securely attached and shall have a firm cushion, pad, or backing or no cushion or pad. Carpet or carpet tile shall have a level loop, textured loop, level cut pile, level cut/uncut pile texture. Pile height shall be 1/2" maximum. Exposed edges of carpet shall be fastened to floor surfaces and shall have trim on the entire length of the exposed edge. Carpet edge trim shall comply with Section 11B-303. (California Building Code)

## 1.4 SUBMITTALS

- A. Submit product data, shop drawings, and samples per Specification 013000 "Administrative Requirements."
  - 1. Include VOC content.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

## 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
  - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
  - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

### 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Master II certification level.
- B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

### 1.10 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

## PART 2 - PRODUCTS

### 2.1 CARPET TILE

- A. Products: As indicated on Drawings.
- B. Applied Soil-Resistance Treatment: Manufacturer's standard material.
- C. Antimicrobial Treatment: Manufacturer's standard material.
- D. Performance Characteristics: As follows:
  - 1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D 7330.
  - 2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
  - 3. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
  - 4. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).

## 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
- C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.
  - 1. Products:
    - a. CTC Transitions.
    - b. Or approved equal.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

### 3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.

- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.
- H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

#### 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

## SECTION 097700 - SPECIAL WALL SURFACES

## 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: Dry-erase special wall surfaces.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
  - 2. Include Preparation requirements and application instructions.
  - 3. Include VOC content.
- B. Shop Drawings: Show location and extent of wallcovering. Indicate seams and termination points.
- C. Samples: For each type of product.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Apply coats on Samples in steps to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For tests performed by a qualified testing agency.
- C. Warranty: Special wall surface manufacturer's warranty.

### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: To include in maintenance manuals.

### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

### 1.7 QUALITY ASSURANCE

- A. Mockups: Apply mockup in area designated by Architect to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Area: Provide samples of at least 100 sq. ft.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install special wall surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at levels intended for occupants after Project completion during the remainder of the construction period.
- B. Lighting: Do not install special wall surfaces until lighting that matches conditions intended for occupants after Project completion is provided on the surfaces to receive the special wall surfaces.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by special wall surface manufacturer for full drying or curing.
- D. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.



- E. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Flame-Spread Index: 25 or less.
    - b. Smoke-Developed Index: 50 or less.
  - 2. Fire-Growth Contribution: No flashover and heat and smoke release according to NFPA 265.

### 2.2 PRODUCTS

- A. Magnetic Wallcovering (MW-1): To be applied over Level 3, 4, or 5 gypsum board finish.
  - 1. Product: IdeaPaint PULL.
- B. Colored Paint (P-1): To be applied over MW-1.
  - 1. Products:
    - a. Behr Ultra.
    - b. PPG Manor Hall.
    - c. Sherwin-Williams SuperPaint.
    - d. Valspar Signature.
  - 2. Finish: Semi-gloss.
- C. Dry-Erase Clear Paint (P-2): To be applied over P-1.
  - 1. Product: IdeaPaint CREATE Clear.
  - 2. Finish: Gloss.
- D. Primer for Dry-Erase White Paint (P-3): To be applied over MW-1.
  - 1. Product: IdeaPaint PRIMER.
- E. Dry-Erase White Paint (P-4): To be applied over P-3.
  - 1. Product: IdeaPaint CREATE White.

2. Finish: Gloss.

### 2.3 MISCELLANEOUS MATERIALS

- A. Roller Covers: Provided by special wall surfaces manufacturer (no substitutions).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Comply with special wall surface manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
  1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
  2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
  3. Metals: If not factory primed, clean and apply primer recommended in writing by primer/sealer manufacturer and wallcovering manufacturer.
  4. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wallcovering manufacturer.
  5. Painted Surfaces: Treat areas susceptible to pigment bleeding.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wallcovering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

### 3.3 WALLCOVERING INSTALLATION

- A. Comply with wallcovering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Cut wall-covering strips in roll number sequence. Change the roll numbers at partition breaks and corners.
- C. Install strips in same order as cut from roll.
- D. Install wall covering without lifted or curling edges and without visible shrinkage.
- E. Match seams 72 inches above the finish floor.
- F. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners.
- G. Trim edges and seams for tight closure. Butt seams without overlaps or gaps between strips.
- H. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

### 3.4 PAINT APPLICATION

- A. Apply paints according to special wall surface manufacturer's written instructions.

### 3.5 CLEANING AND PROTECTION

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- C. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- D. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- E. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 097700

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## SECTION 099113 - EXTERIOR PAINTING

## 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. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
  - 1. Steel.
  - 2. Galvanized metal.
  - 3. Wood.
- B. Related Requirements:
  - 1. Section 099123 "Interior Painting."

## 1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

## 1.4 ACTION SUBMITTALS

- A. Submit product data and samples per Specification 013000 "Administrative Requirements."
  - 1. Include VOC content.

### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

### 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design: Vista Paint.
- B. Other Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Benjamin Moore.
  - 2. Dunn-Edwards Corporation.
  - 3. Sherwin Williams.

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: Match Architect's samples.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

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

## 3.2 PREPARATION

- A. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- C. Recommended in writing by paint manufacturer. but not less than the following:
  - 1. SSPC-SP 3 "Power Tool Cleaning."
- D. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

## 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations.

1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  4. Paint entire exposed surface of window frames and sashes.
  5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

### 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 EXTERIOR PAINTING SCHEDULE

- A. Steel - Unprimed: 100% Acrylic, Semi-Gloss:
1. Vista Paint:
    - a. Prime Coat: Alkyd Emulsion Corrosion Resistant primer. 9600 Protec Metal Primer.



- b. Intermediate Coat: Water-based, 100% acrylic low sheen finish: 8400 Carefree Semi-Gloss.
    - c. Topcoat: Water-based, 100% acrylic low sheen finish: 8400 Carefree Semi-Gloss.
- B. Steel - Shop Primed: 100% Acrylic, Semi-Gloss:
  - 1. Vista Paint:
    - a. Prime Coat (touch-up): Alkyd Emulsion Corrosion Resistant primer. 9600 Protec Metal Primer.
    - b. Intermediate Coat: Water-based, 100% acrylic low sheen finish: 8400 Carefree Semi-Gloss.
    - c. Topcoat: Water-based, 100% acrylic low sheen finish: 8400 Carefree Semi-Gloss.
- C. Steel - Galvanized: 100% Acrylic, Semi-Gloss:
  - 1. Vista Paint:
    - a. Pretreatment: Chemical etch: Krud Kutter Metal Etch.
    - b. Prime Coat: Water-based acrylic coating: Water-based, low VOC acrylic coating: 4800 Metal Pro Primer.
    - c. Intermediate Coat: Water-based, 100% acrylic low sheen finish: 8400 Carefree Semi-Gloss.
    - d. Topcoat: Water-based, 100% acrylic low sheen finish: 8400 Carefree Semi-Gloss.
- D. Wood: 100% Acrylic Solid Body Stain:
  - 1. Vista Paint:
    - a. Base Coat: Water-based, 100% acrylic solid body stain: 2200 Coverall Flat.
    - b. Topcoat: Water-based, 100% acrylic solid body stain: 2200 Coverall Flat.

END OF SECTION 099113

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## SECTION 099123 - INTERIOR PAINTING

## 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: Surface preparation and application of paint systems on the following interior substrates:
  - 1. Wood.
  - 2. Gypsum board.
- B. Related Requirements:
  - 1. Section 097700 "Special Wall Surfaces" for dry erase paint.

## 1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

## 1.4 ACTION SUBMITTALS

- A. Submit product data and samples per Specification 013000 "Administrative Requirements."
  - 1. Include VOC content.

### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

### 1.7 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Basis-of-Design: Vista Paint.
- B. Other Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Benjamin-Moore.
  - 2. Dunn-Edwards Corporation.
  - 3. Sherwin-Williams Paint.

### 2.2 PAINT, GENERAL

- A. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: Match Architect's samples.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

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

## 3.2 PREPARATION

- A. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- C. Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Sand surfaces that will be exposed to view, and dust off.
  - 3. Prime edges, ends, faces, undersides, and backsides of wood.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- D. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions.
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

### 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 INTERIOR PAINTING SCHEDULE

- A. Gloss Degree:
  - 1. General use walls and ceilings: 30-47 (eggshell).
  - 2. Wood trim: 48-69 (semi-gloss).
- B. Gypsum Board: Zero VOC, Low Odor. Acrylic, Eggshell Finish:

1. Vista Paint:
  - a. Prime Coat: Water-based, odor free, zero VOC interior acrylic primer: 5001 V-Pro Primer.
  - b. Intermediate Coat: Water-based, odor free, zero VOC acrylic eggshell finish: 5300 V-Pro Eggshell.
  - c. Topcoat: Water-based, odor free, zero VOC acrylic eggshell finish: 5300 V-ProEggshell.

C. Wood - Painted: Zero VOC, Low Odor. Acrylic, Semi-Gloss Finish:

1. Vista Paint:
  - a. Prime Coat: Water-based, odor free, zero VOC interior acrylic primer: 5001 V-Pro Primer.
  - b. Intermediate Coat: Water-based, odor free, zero VOC acrylic semi-gloss finish: 5400 V-Pro Semi-Gloss.
  - c. Topcoat: Water-based, odor free, zero VOC acrylic semi-gloss finish: 5400 V-Pro Semi-Gloss.

END OF SECTION 099123

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## SECTION 101100 - VISUAL DISPLAY SURFACES

## 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: Tackboards.

## 1.3 ACTION SUBMITTALS

- A. Product Data: Include details and dimensions of individual components and profiles, and finishes for visual display surfaces.
  - 1. Include VOC content.
- B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show locations of panel joints.
  - 2. Include sections of typical trim members.
- C. Samples: For visual display surface and trim indicated.

## 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for surface-burning characteristics.
- C. Warranties: Sample of special warranties.

## 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

## 1.6 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: 25 or less.
  - 2. Smoke-Developed Index: 450 or less.
- B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate appearance and aesthetic effects and set quality standards for installation.
  - 1. Build mockup of typical wall area for tack boards.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- C. Preinstallation Conference: Conduct conference at Project site.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-built visual display surfaces, including factory-applied trim, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.
- B. Store visual display surfaces vertically with packing materials between each unit.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.
  - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

## PART 2 - PRODUCTS

### 2.1 TACKBOARDS

- A. Product: Forbo Bulletin Board.
  - 1. Material: Pinboard linoleum.

2. Thickness: 6.0 mm + - 0.25 mm.
3. Roll Width: 1.22 m (3 colors in 1.83 m).
4. Roll Length:  $\leq 28$  m.
5. Recycled Content: 43%.
6. Gloss: Only available in matt colors, so that reflection caused by sunlight or artificial light is reduced.
7. Color: As selected by Architect from manufacturer's full range.

## 2.2 ACCESSORIES

- A. Anodized Aluminum Trim: Schluter Schiene.

## 2.3 MISCELLANEOUS MATERIALS

- A. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Section 099123 "Interior Painting" and recommended in writing by wall covering manufacturer for intended substrate.

## 2.4 FABRICATION

- A. Aluminum Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

## 2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## 2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display surfaces.

- C. Examine walls and partitions for suitable framing depth where sliding visual display units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.
  - 1. Prime wall surfaces indicated to receive direct-applied, visual display tack wall panels and as recommended in writing by primer/sealer manufacturer and wall covering manufacturer.
  - 2. Prepare substrates indicated to receive visual display wall covering as required by manufacturer's written instructions to achieve a smooth, dry, clean, structurally sound surface that is uniform in color.
    - a. Moisture Content: Maximum of 4 percent when tested with an electronic moisture meter.
    - b. Metals: If not factory primed, clean and apply metal as recommended in writing by primer/sealer manufacturer and wall covering manufacturer.
    - c. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall covering manufacturer.
    - d. Painted Surfaces: Treat areas susceptible to pigment bleeding.

### 3.3 INSTALLATION OF TACKBOARDS

- A. Attach to wall surface with adhesive per tackboard manufacturer's written installation instructions.

### 3.4 CLEANING AND PROTECTION

- A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100

SECTION 102800 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SECTION REQUIREMENTS

- A. Submittals: Product Data.

1.2 ACCESSIBILITY REQUIREMENTS

- A. Elements of sanitary facilities shall be mounted at locations in compliance with California Building Code (CBC) Sections 11B-602 through 11B-612.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. See attached.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items. Remove temporary labels and protective coatings.

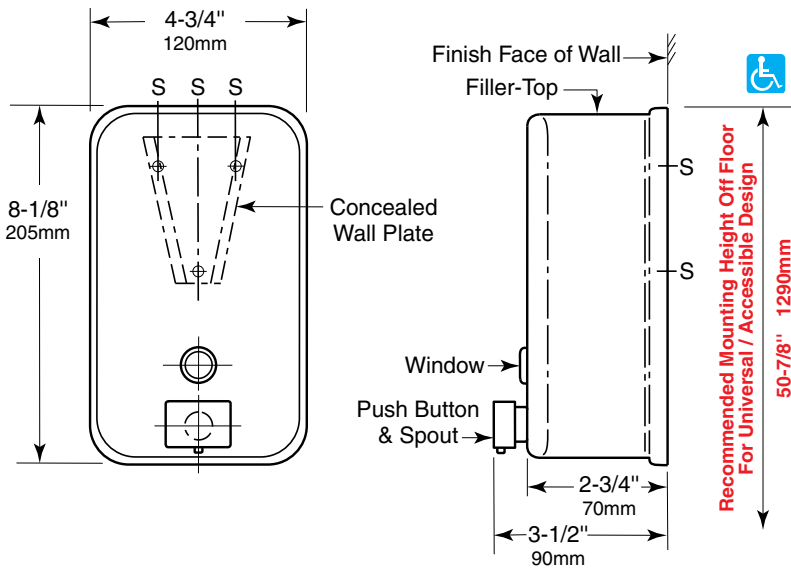
END OF SECTION 102800



## Technical Data

# ClassicSeries® SURFACE-MOUNTED SOAP DISPENSER

# B-2111



### MATERIALS:

**Container** — 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin-finish. Body is drawn, one-piece, seamless construction. Back plate has mounting bracket attached. Furnished with concealed wall plate. Equipped with a clear acrylic refill-indicator window and a locked, hinged stainless steel lid for top filling. Capacity: 40-fl oz (1.2-L).

**Valve** — Black molded plastic push button and spout. Soap head-holding mushroom valve. Stainless steel spring. U-packing seal and duckbill. Antibacterial-soap-resistant plastic cylinder.

### OPERATION:

Corrosion-resistant valve dispenses commercially marketed all-purpose hand soaps. To prevent corrosion of the tank, use only chloride-free pH-neutral liquid soaps. Valve is operable with one hand, without tight grasping, pinching, or twisting of the wrist, and with less than 5 pounds of force (22.2 N) to comply with accessible design guidelines (including ADAAG in the U.S.A.). Window indicates when refill is required. The locked, hinged lid opens for top filling only with special key provided. Concealed, vandal-resistant mounting.

### INSTALLATION:

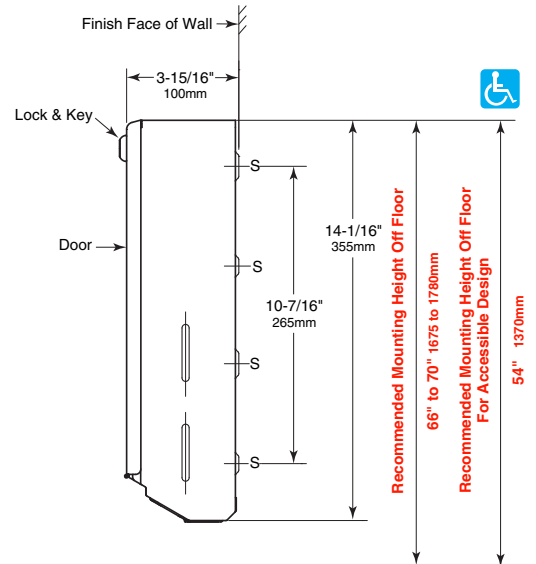
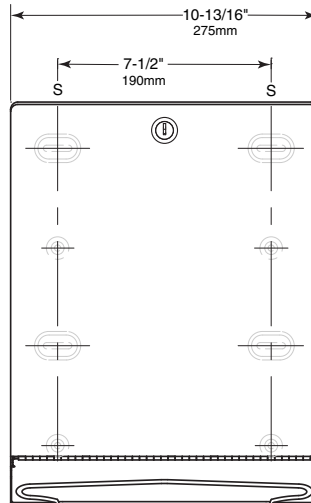
Secure wall plate to the wall with three sheet-metal screws, furnished by manufacturer, at points indicated by an S. Slide mounting bracket of container down onto wall plate and secure unit with furnished locking-screw. For plaster or dry wall construction, provide concealed backing to comply with local building codes and secure with sheet-metal screws furnished. For other wall surfaces, provide fiber plugs or expansion shields for use with sheet-metal screws furnished, or provide 1/8" (3mm) toggle bolts or expansion bolts.

**Note:** Surface-mount the dispenser plumb and true with valve 6" (150mm) to right or left of lavatory center. Provide 4" (100mm) minimum clearance from the lid to the underside of any horizontal projection. Push buttons should be located 44" (1120mm) maximum above the finish floor.

### SPECIFICATION:

Surface-mounted soap dispenser shall be Type-304 stainless steel with satin-finish. Corrosion-resistant valve shall dispense commercially marketed all-purpose hand soaps, non-iodine based soaps and do not use alcohol based sanitisers. To prevent corrosion of the tank, use only chloride-free pH-neutral liquid soaps. Valve shall be operable with one hand and with less than 5 pounds of force (22.2 N) to comply with accessible design guidelines (including ADAAG in the U.S.A.). Container shall be equipped with a clear acrylic refill-indicator window; a locked, hinged stainless steel lid for top filling; and shall have a capacity of 40-fl oz (1.2-L). Unit shall have concealed, vandal-resistant mounting.

**Surface-Mounted Soap Dispenser shall be Model B-2111 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**

**BOBRICK****Technical Data****ClassicSeries®  
SURFACE-MOUNTED  
PAPER TOWEL DISPENSER****B-262****MATERIALS:**

**Cabinet** — 18-8, type-304, 22-gauge (0.8mm) stainless steel. All-welded construction. Exposed surfaces have satin finish. Towel tray has hemmed opening to dispense paper towels without tearing.

**Door** — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.

**Optional:** Order Bobrick Part No. 262-130 TowelMate® available as an optional accessory. TowelMate accessory allows for paper towels to dispense one at a time without bulging, sagging or falling through the towel tray opening. TowelMate fits Gamco and most manufacturers' similar models.

**OPERATION:**

Unit dispenses C-fold and multifold paper towels 3-1/8" to 3-13/16" (79–97mm) deep. Slots in sides of cabinet indicate refill time. Capacity: 400 C-fold or 525 multifold paper towels. To dispense narrower towels 2-1/2" to 3-1/8" (64–79mm) deep, order optional TowelMate accessory Bobrick Part No. 262-130.

**INSTALLATION:**

Mount unit on wall with four #10 x 1-1/4" (4.8 x 32mm) sheet-metal screws (not furnished) at four of the eight mounting holes indicated by an S (top slots and bottom holes preferable). For plaster or dry wall construction, provide concealed backing to comply with local building codes, then secure with sheet-metal screws. For other wall surfaces, provide fiber plugs or expansion shields for use with sheet-metal screws, or provide 1/8" (3mm) toggle bolts or expansion bolts.

**SPECIFICATION:**

Surface-mounted paper towel dispenser shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Paper towel tray shall have hemmed opening to dispense paper towels without tearing. Unit shall be capable of dispensing 400 C-fold or 525 multifold paper towels measuring 3-1/8" to 3-13/16" (79 to 97mm) deep. Narrower paper towels 2-1/2" to 3-1/8" (65 to 79mm) deep may be efficiently dispensed with the use of an optional TowelMate accessory, Bobrick Part No. 262-130. TowelMate accessory allows for paper towels to dispense one at a time without bulging, sagging or falling through the towel tray opening.

**Surface-Mounted Paper Towel Dispenser shall be Model B-262 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**

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## SECTION 107110 - EXTERIOR SUN CONTROL DEVICES

## 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: Fixed custom sunshades as shown on the drawings, as specified, and as needed for a complete and proper installation.

## 1.3 REFERENCES

- A. National Association of Architectural Metal Manufacturers (NAAMM).
- B. American Architectural Manufacturers Association (AAMA).

## 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, recommendations, and standard details.
- B. Shop Drawings: Submit shop drawings including plans, elevations, complete details for materials, finishes, sizes, profiles, methods of anchoring, and caulking.
- C. Samples: Submit Samples of required aluminum finish on 6-inch sections of extruded aluminum.
- D. Delegated-Design and Deferred Submittal: Comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

## 1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain exterior sun control devices, bi-fold doors, entrance, storefront, windows, and finish, through one source from a single manufacturer.

## 1.6 WARRANTY

- A. Exterior sun control devices shall be warranted against failure and/or deterioration of metals due to manufacturing process for a period of two (2) years after Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Loads: As indicated on Drawings.
- B. Seismic Performance: Determined according to ASCE/SEI 7.
- C. Min. 20 psf (ASD) wind pressure design.

### 2.2 MANUFACTURERS

- A. Basis-of-Design and Permit Approval: Arcadia Brise Soleil Standard Series.

### 2.3 MATERIALS

- A. Aluminum Extrusion Blades: ASTM B211, Alloy 6063-T6.
- B. Aluminum Plate: ASTM B211, Alloy 6061-T6; yield strength min. 35,000 psi.
- C. Fasteners: Fasteners shall be stainless steel. Provide types, gauges and lengths to suit unit installation conditions.
- D. Anchors and Inserts: Use non-Ferrous metal or hot dip galvanized anchors and inserts for installation and elsewhere as required for corrosion resistance. Use stainless steel or zinc galvanized expansion bolt devices for drill-in place anchors. Furnish inserts, as required, to be set into concrete or masonry work. Field weld clips.
- E. Sealant: See Specification 079200 "Joint Sealants."

### 2.4 FABRICATION, GENERAL

- A. Provide fixed Sunshades and accessories of design, material, sizes, depth, arrangement, and thickness as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.
- B. Include supports, anchorage, and accessories required for complete assembly, including all attachment clips and necessary hardware for attachment to structure.
- C. Manufacturer shall allow +/- 1/8" thermal expansion room at each shade to compensate for dissimilar movement between building structure and aluminum sunshade structure. This design shall be incorporated as to not induce self destructing loads onto either shade or building veneer.

- D. No blade fasteners shall be visible after installation of sections. Provide cover plates at each outrigger end to conceal fasteners. Only mounting hardware shall be visible after installation.

## 2.5 FABRICATION, SUNSHADES

### A. Components:

1. All fascia and blades shall be 6063-T6 aluminum-extruded members.
  - a. Blade infill shall be custom designed with integral screw boss that is hidden from view visible after installation. Size and spacing is to be as shown on the architectural details. Blade infill shall be airfoils, rectangle or tubular sections.
  - b. Blades to be miter cut and fitted to outrigger plates at mitered corner conditions.
2. Outrigger components shall be 6061-T6 aluminum plates.
  - a. Outriggers shall be tapered or shaped aluminum flat plates, screwed to aluminum extrusion blades via countersunk fastener holes. Connections of aluminum extrusions to outriggers should be flush with no protruding fasteners visible after installation. Outriggers are pre-drilled for mounting to the structural sunshade clip tab via stainless steel expansion slip connection to compensate for thermal expansion.
3. Clip brackets shall be of carbon steel.
  - a. Connection of sunshade to building shall be friction type with the ability to properly level the shade during installation.
4. Outrigger cover plates shall be furnished of 6061-T6 aluminum plates at each end of sunshade run to cover extrusion fasteners.

- ### B. Assembly: Components to be shop assembled in large practical sections to allow for immediate installation. Sections indicated on shop drawings to be assembled and shipped as units with cover plates and support arms, if required, shipped loose.

1. Fasteners shall be bagged in groups clearly identifying bolt locations and bag contents for easy installation. Manufacturer to provide anti-seize compound for any field bolted stainless hardware to facilitate proper erection.

## 2.6 ALUMINUM FINISH

### A. Finish all exposed areas of aluminum and components as indicated.

1. Architectural Class I anodic coating conforming with AA-M12C22A31/AA-M12C22A41.
  - a. Anodize finish color shall be Colornodic #11 Clear.

## PART 3 - EXECUTION

## 3.1 MATERIAL INSPECTION

- A. Examine crates and reconcile to a shipping manifest or packing slip. Verify all required components are present.

## 3.2 FIELD DIMENSIONS / SITE INSPECTION

- A. Prior to Clip Installation:
  - 1. Verify conditions: Examine areas where work is to be performed and identify any conditions that could be detrimental to proper or timely completion.
- B. Prior to Shade Installation:
  - 1. Contractor Shall field confirm openings widths and elevations as shown on shop drawings prior to fabrication of shade sections. Field dimensions of clip locations shall be verified prior to fabrication of sections.
- C. Installation of sections should not proceed until all conditions are satisfactory.

## 3.3 INSTALLATION / ERECTION

- A. Comply with DSA approved plans and manufacturer's instructions and recommendations for installation of the work.
- B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated, and fitted to the structure.
- C. Anchor Sunscreen to building substructure as indicated on the sunshade shop drawings and verified by the engineer of record.
- D. Erection Tolerances:
  - 1. Clips or Mounting Brackets:
    - a. Elevation clip Variation from level: 1/8" maximum in any column to column space or 20'-0" runs, non-cumulative.
    - b. Offsets in projection of clips front leading edge 1/16" +/-.
    - c. Veneer or Wall construction tolerance around clip projection. 1/4"+ outward.
    - d. Clip Plumbness: 1/16" in 6"
    - e. Clip projection level: 1/16" in 12"
  - 2. Shade Sections:
    - a. Projection Level: 1/8" in 4'-0"
    - b. Horizontal Level: 1/8" max in any column to column space or in 20'-0" runs, non-cumulative.

- c. Shade section to section variation 1/32" at adjoining sections.
- E. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
- F. Set units level, plumb and true to line, with uniform joints.
- G. Erect sunshade sections after all adjacent painting, masonry (including chemical treatments), roofing, electrical, glazing, and other similar work is completed above and below the shade sections.

END OF SECTION 107110

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## SECTION 123661.16 - SOLID SURFACING COUNTERTOPS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

## A. Section Includes:

1. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material end splashes.
4. Solid surface material apron fronts.

## B. Related Requirements:

1. Section 064116 "Plastic-Laminate-Clad Architectural cabinets" to coordinate solid surfacing countertops with cabinets.
2. Section 224000 "Plumbing Fixtures" for sinks and plumbing fittings.

## 1.3 ACTION SUBMITTALS

## A. Product Data: For countertop materials.

## B. Sustainable Design Submittals:

1. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

## C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.
2. Show direction of directional pattern, if any.

## D. Samples: For each type of material exposed to view.

## 1.4 INFORMATIONAL SUBMITTALS

## A. Qualification Data: For fabricator.

### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

### 1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.
- C. Quality Standard: North American Architectural Woodwork Standards (NAAWS) for construction, finishes, installation, and other requirements.
  - 1. Grade: Custom.

### 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

### 1.8 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

## PART 2 - PRODUCTS

### 2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Corian.
    - b. Formica.
    - c. Or approved equal.
  - 2. Type: Provide Standard type.
  - 3. Colors and Patterns: As selected by Architect from manufacturer's full range.
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.



## 2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the North American Architectural Woodwork Standards.
  - 1. Grade: Custom.
- B. Configuration:
  - 1. Front: Straight, slightly eased at top.
  - 2. Backsplash: Straight, slightly eased at corner.
  - 3. End Splash: Matching backsplash.
- C. Countertops: 1/2-inch-thick, solid surface material with front edge built up with same material.
- D. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
- E. Joints: Fabricate countertops without joints.

## 2.3 INSTALLATION MATERIALS

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

- C. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
- D. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- E. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- F. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Pre-drill holes for screws as recommended by manufacturer.
- G. Apply sealant to gaps at walls; comply with Section 079200 "Joint Sealants."

END OF SECTION 123661.16

## SECTION 220523

## GENERAL-DUTY VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

## 1.2 SUMMARY

## A. Section Includes:

1. Bronze ball valves.
2. Ductile-iron, single-flange butterfly valves.
3. Bronze lift check valves.
4. Bronze swing check valves.
5. Bronze gate valves.

## B. Related Sections:

1. Division 33 water distribution piping Sections for general-duty and specialty valves for site construction piping.
2. Division 15 plumbing piping Sections for specialty valves applicable to those Sections only.
3. Division 15 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

## 1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene diene terpolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

#### 1.4 SUBMITTALS

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

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 2. ASME B31.1 for power piping valves.
  - 3. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61-G and NSF-372 for valve materials for potable-water service.
  - 1. Valves for domestic water must comply with the Federal Reduction of Lead in Drinking Water Act.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Set butterfly valves closed or slightly open.
  - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

### PART 2 - PRODUCTS

#### 2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Bronze valves shall be made with dezincification-resistant materials, (Bronze ASTM B62, B61, or B584 Alloy C87850). This includes body, ball, stem and / or trim.
- C. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.
- D. Ferrous Valves: NPS 2-1/2 and larger with flanged ends, unless otherwise indicated.

- E. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
  - 1. Hand-wheel: For valves other than quarter-turn types.
  - 2. Hand-lever: For quarter-turn valves NPS 6 and smaller.
- H. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
  - 1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Nib-seal handle extension or comparable product by one of the following:
      - 1) Conbraco Industries, Inc.; Apollo Div.
      - 2) Milwaukee Valve Company.
  - 2. Butterfly Valves: With extended neck.
- I. Valve-End Connections:
  - 1. Flanged: With flanges according to ASME B16.1 for iron valves, ASME B16.5 for steel valves.
  - 2. Grooved: With grooves according to AWWA C606.
  - 3. Solder Joint: With sockets according to ASME B16.18.
  - 4. Threaded: With threads according to ASME B1.20.1.
- J. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

- A. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim & Nib-Seal Handle:
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-595-Y-66-LF or T-595-Y-66-LF or a comparable product by one of the following,
    - a. Conbraco Industries, Inc.; Apollo Div.
    - b. Milwaukee Valve Company.
  - 2. Description:
    - c. Standard: MSS SP-110, NSF 61-G.
    - d. CWP Rating: 600 psig.
    - e. Body Design: Three piece with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.
    - f. Body Material: Bronze ASTM B 584 Alloy C87850 or C87600.

- g. Ends: Threaded or Solder.
- h. Seats: PTFE or TFE.
- i. Stem: 316 Stainless steel.
- j. Ball: 316 Stainless steel, vented.
- k. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim & Nib-Seal Handle:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-585-66-LF or T-585-66-LF or a comparable product by one of the following:
  - a. Conbraco Industries, Inc.; Apollo Div.
  - b. Milwaukee Valve Company.
2. Description:
  - a. Standard: MSS SP-110, NSF 61-G.
  - b. CWP Rating: 600 psig.
  - c. Body Design: Two piece with threaded body packnut design (no threaded stem designs allowed) with adjustable stem packing.
  - d. Body Material: Bronze ASTM B 584 Alloy C87600.
  - e. Ends: Threaded or Solder.
  - f. Seats: PTFE or TFE.
  - g. Stem: 316 Stainless steel.
  - h. Ball: 316 Stainless steel, vented.
  - i. Port: Full.

C. 200 CWP, Sizes 2-1/2" – 24", Ductile Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model LD-2000-3/5, or a comparable product by one of the following:
  - a. Cooper Cameron Corp.; Cooper Cameron Valves Div.
  - b. Tyco International, Ltd.; Tyco Valves & Controls
2. Description:
  - a. Standard: MSS SP-67, Type I, IAPMO.
  - b. NPS 24 (DN 300) and Smaller CWP Rating: 200 psig (1380 kPa).
  - c. Body Design: Full Lug type; Bubble tight shutoff, suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
  - d. Body Material: ASTM A 536, ductile iron.
  - e. Seat: EPDM.
  - f. Stem: One- or two-piece stainless steel.
  - g. Disc: Aluminum bronze

D. Retain one or more of six paragraphs in this article if iron, single-flange butterfly valves are required. MSS SP-67 covers iron, single-flange butterfly valves NPS 1-1/2 to NPS 72.

2.3 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Nonmetallic TFE Disc:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-480-Y-LF or T-480-Y-LF or a comparable product by one of the following:
  - a. Crane Co.; Crane Valve Group; Crane Valves.
  - b. Powell Valves.
2. Description:
  - a. Standard: MSS SP-80, Type 2, NSF 61-G.
  - b. CWP Rating: 200 psig.
  - c. Body Design: Vertical flow.
  - d. Body Material: ASTM B 584 Alloy C87850, lead free bronze.
  - e. Ends: Threaded or Solder.
  - f. Disc: PTFE, or TFE.

2.4 BRONZE SWING CHECK VALVES

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

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-413-Y-LF or T-413-Y-LF or a comparable product by one of the following:
  - a. Crane Co.; Crane Valve Group; Crane Valves.
  - b. Powell Valves.
2. Description:
  - a. Standard: MSS SP-80, Type 4, NSF 61-G.
  - b. CWP Rating: 200 psig.
  - c. Body Design: Y-pattern Horizontal flow.
  - d. Body Material: ASTM B 584 Alloy C87850, lead free bronze.
  - e. Ends: Threaded or Solder.
  - f. Disc: PTFE or TFE.

2.5 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model S-113-LF or T-113-LF or a comparable product by one of the following:
  - a. Crane Co.; Crane Valve Group; Crane Valves.
  - b. Powell Valves.
2. Description:
  - a. Standard: MSS SP-80, Type 2, NSF 61-G.
  - b. CWP Rating: 200 psig.

- c. Body Material: ASTM B 584, bronze with integral seat and threaded bonnet.
- d. Ends: Threaded or Solder.
- e. Stem: Lead free copper-Silicon Bronze.
- f. Disc: Solid wedge; lead free bronze.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron.

## 2.6 IRON GATE VALVES

### A. Class 125, NRS, Cast-Iron Gate Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide NIBCO Model F-619-RW or a comparable product by one of the following:
  - a. Crane Co.; Crane Valve Group; Crane Valves.
  - b. Powell Valves.
2. Description:
  - a. Standard: MSS SP-70, Type I.
  - b. CWP Rating: 200 psig.
  - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
  - d. Ends: Flanged.
  - e. Trim: Lead free copper alloy or stainless steel.
  - f. Disc: Solid wedge.
  - g. Packing and Gasket: Asbestos free.

## PART 3 - EXECUTION

### 2.7 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.



## 2.8 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Check Valves: In horizontal or vertical position, between flanges.
  - 3. Lift Check Valves: With stem upright and plumb.

## 2.9 ADJUSTING

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

## 2.10 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball, butterfly valves.
  - 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
  - 3. Throttling Service: Ball or Butterfly valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
  - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends.
  - 3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
  - 4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.

## 2.11 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
  - 1. Bronze Valves: Threaded ends.
  - 2. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
  - 3. Bronze Lift Check Valves: Class 125, nonmetallic TFE disc.
  - 4. Bronze Swing Check Valves: Class 150, nonmetallic TFE disc.
  - 5. Bronze Gate Valves: Class 150, RS.

B. Pipe NPS 2-1/2 and Larger:

1. Ductile-Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.

END OF SECTION

## SECTION 220553

## IDENTIFICATION FOR PLUMBING EQUIPMENT

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Valve tags.
  - 5. Warning tags.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

## 1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

## PART 2 - PRODUCTS

## 2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
1. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
  3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
  4. Fasteners: Stainless-steel rivets or self-tapping screws.
  5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- H. Label Content: Include caution and warning information, plus emergency notification instructions.

## 2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 incheshigh.

## 2.4 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
  - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
  - 1. Valve-tag schedule shall be included in operation and maintenance data.

## 2.5 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
  - 1. Size: 3 by 5-1/4 inches minimum.
  - 2. Fasteners: Brass grommet and wire.
  - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  - 4. Color: Yellow background with black lettering.

## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

## 3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

## 3.3 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
  - 1. Valve-Tag Size and Shape:
    - a. Cold Water: 1-1/2 inches, round.
    - b. Hot Water: 1-1/2 inches, round.
  - 2. Valve-Tag Color:
    - a. Cold Water: Natural.
    - b. Hot Water: Natural.
  - 3. Letter Color:
    - a. Cold Water: Black.
    - b. Hot Water: Black.

## 3.4 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

## SECTION 221116

## DOMESTIC WATER PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
  - 2. Encasement for piping.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

## 1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

## 1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of water service.
  - 2. Do not interrupt water service without Architect's written permission.

## PART 2 - PRODUCTS

## 2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

## 2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- E. Copper Unions:
  - 1. MSS SP-123.
  - 2. Cast-copper-alloy, hexagonal-stock body.
  - 3. Ball-and-socket, metal-to-metal seating surfaces.
  - 4. Solder-joint or threaded ends.

## 2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
  - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
  - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

## 2.4 ENCASUREMENT FOR PIPING

- A. Standard: ASTM A 674 or AWWA C105/A21.5.



- B. Form: Sheet or tube.
- C. Color: natural.

### PART 3 - EXECUTION

#### 3.1 EARTHWORK

- A. Comply with requirements in Division 31 for excavating, trenching, and backfilling.

#### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- D. Install shutoff valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages and with requirements for drain valves and strainers.
- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install domestic water piping level without pitch and plumb.
- G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- J. Install piping to permit valve servicing.
- K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.

- N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- O. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves.
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals.
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons.

### 3.3 JOINT CONSTRUCTION

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

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices.
- B. Comply with requirements for pipe hanger, support products, and installation.
  - 1. Vertical Piping: MSS Type 8 or 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
  - D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
  - E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
    1. NPS 2 and Smaller: 72 inches with 3/8-inch rod.
    2. NPS 2-1/2 to NPS 3: 8 feet with 1/2-inch rod.
    - 3.
  - F. Install supports for vertical copper tubing every 10 feet.
  - G. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

### 3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
  3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.6 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Equipment."
- B. Label pressure piping with system operating pressure.

### 3.7 FIELD QUALITY CONTROL

#### A. Perform the following tests and inspections:

##### 1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
  - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
  - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

##### 2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

### 3.8 ADJUSTING

#### A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.

2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
  - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
  - b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

### 3.9 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
  1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

### 3.10 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:
  - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- E. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:
  - 1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
- F. Aboveground domestic water piping shall be the following:
  - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

### 3.11 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION

SECTION 221119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Hose bibbs.
  - 2. Water-hammer arresters.
  - 3. Trap-seal primer valves.
  - 4. Trap-seal primer systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For domestic water piping specialties.
  - 1. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 and NSF 14.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

## 2.3 HOSE BIBBS

- A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Include operating key with each operating-key hose bibb.

## 2.4 WATER-HAMMER ARRESTERS

- A. Water-Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Precision Plumbing Products, Inc.
  - b. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

## 2.5 TRAP-SEAL PRIMER DEVICE

- A. Supply-Type, Trap-Seal Primer Device:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. Precision Plumbing Products, Inc.
  - c. Sioux Chief Manufacturing Company, Inc.
2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.



5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

## 2.6 TRAP-SEAL PRIMER SYSTEMS

### A. Trap-Seal Primer Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Precision Plumbing Products, Inc.
2. Standard: ASSE 1044.
3. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
4. Cabinet: Surface-mounted steel box with stainless-steel cover.
5. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
  - a. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Vacuum Breaker: ASSE 1001.
7. Number Outlets: Four.
8. Size Outlets: NPS 1/2.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install water-hammer arresters in water piping according to PDI-WH 201.
- B. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- C. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

### 3.2 CONNECTIONS

- A. Comply with requirements for ground equipment.
- B. Fire-retardant-treated-wood blocking is specified in appropriate Electrical Section, for electrical connections.

### 3.3 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
  - 1. Supply-type, trap-seal primer valves.
  - 2. Trap-seal primer systems.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Equipment."

### 3.4 FIELD QUALITY CONTROL

- A. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
- B. Prepare test and inspection reports.

### 3.5 ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION

## SECTION 221316

## SANITARY WASTE AND VENT PIPING

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.
  - 3. Encasement for underground metal piping.

## 1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

## 1.4 ACTION SUBMITTALS

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

## 1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

## 1.6 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

## 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
  - 2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

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

### 2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

- A. CISPI, Hubless-Piping Couplings:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. ANACO-Husky SD 4000 series.
  - b. Clamp All HI\_TORQ 125 series
- 2. Standards: ASTM C 1277 and CISPI 310.
- 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- 4. All above ground vent pipe fittings may be made with "ANACO" or "Clamp All" stainless steel two hand couplings conforming to CISPI Standard 310.

### 2.3 ENCASUREMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A 674 or AWWA C105/A 21.5.
- B. Material: Linear low-density polyethylene film of 0.008-inch minimum thickness.
- C. Form: Sheet or tube.
- D. Color: Natural.

## PART 3 - EXECUTION

### 3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Division 31.

### 3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
  - 1. Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
  - 2. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- N. Plumbing Specialties:
  - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with

closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts.

2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains.
- O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves.
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals.
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons.

### 3.3 JOINT CONSTRUCTION

- A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

### 3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices.
- B. Comply with requirements for pipe hanger and support devices and installation.
  1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
  3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
  4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
  5. Vertical Piping: MSS Type 8 or Type 42, clamps.
  6. Install individual, straight, horizontal piping runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
  7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  2. NPS 3: 60 inches with 1/2-inch rod.
  3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
  4. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
  1. NPS 1-1/4: 84 inches with 3/8-inch rod.
  2. NPS 1-1/2: 108 inches with 3/8-inch rod.
  3. NPS 2: 10 feet with 3/8-inch rod.
  4. NPS 2-1/2: 11 feet with 1/2-inch rod.
  5. NPS 3: 12 feet with 1/2-inch rod.
  6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
- I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

### 3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

### 3.6 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Equipment."

### 3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
  - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
  - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
  - 6. Prepare reports for tests and required corrective action.

### 3.8 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.



- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

### 3.9 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping shall be the following:
  - 1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
- C. Aboveground, vent piping shall be the following:
  - 1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
- D. Underground, soil, waste, and vent piping shall be the following:
  - 1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.

END OF SECTION

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## SECTION 224216.16

## COMMERCIAL SINKS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

## 1.2 SUMMARY

- A. Section Includes:

- 1. Service sinks.
- 2. Sink faucets.

## 1.3 WORK INCLUDED

- A. Furnish all labor, materials, services, testing, transportation and equipment necessary for the completion of all plumbing work as indicated on drawings and specified herein. Work materials and equipment not indicated or specified which is necessary for the complete and proper operation of the work of this Section in accordance with the true intent and meaning of the contract documents shall be provided and incorporated at no additional cost to the Owner.

## 1.4 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
  - 9. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.
  - 10. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
  - 11. Accessible fixture controls shall comply with CBC Sections 11B-611.3 for lavatories and sinks.

- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.5 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.6 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.7 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

## 1.8 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

## 1.9 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

## 1.10 SUBMITTAL DATA

- A. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.
  - 2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.

3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".
  - b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.

2. It shall be the Contractor's responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.11 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.

1.12 UNINSPECTED WORK

- A. The Contractor shall not allow or cause any of his work to be covered up or closed in until it has been inspected, tested, approved by all authorities have jurisdiction, and until Project Record drawings have been properly annotated.
- B. Should any of his work be covered up or closed in before such inspection, he shall, at his own expense, uncover the work to the satisfaction of the inspection party. All related repair work cost shall be borne by the Contractor.

1.13 RECORD DRAWINGS

- A. Contractor shall provide and keep up-to-date a complete "as-built" record set of blueline prints which shall show every change from the original drawings and the exact "as-built" locations and sizes of the work provided under this Section of the specifications. This set shall include locations, dimensions, depth of buried piping, cleanouts, shut-off valves, sewer invert locations, plugged wyes, tees, etc. On completion of the work, the Contractor shall incorporate all as-built information on a set of reproducible tracings provided by the Architect and this set of reproducibles shall be delivered to the Architect.

## 1.14 GUARANTEES

- A. Contractor shall guarantee the entire plumbing and piping systems unconditionally for a period of one (1) year after final acceptance. If, during this period, any materials, equipment, or any part of the systems fail to function properly, the Contractor shall make good the defects promptly and without any expense to the Owner.
- B. Contractor shall be responsible for all damage to any part of the premises caused by leaks in pipelines or equipment furnished and installed under this Section for a period of one (1) year after date of acceptance of his work.
- C. All equipment and fixtures shall carry manufacturer's warranty against defective parts or poor workmanship for not less than one (1) year. See specific equipment specifications for extended warranty requirements.

## PART 2 - PRODUCTS

## 2.1 Equipment and Fixtures:

- A. Fixtures:
  - 1. See schedule on drawings.

## 2.2 SERVICE SINKS

- A. Service Sinks: Enameled, cast iron, floor mounted.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Commercial Enameling Company (CECO).
    - b. American Standard America.
    - c. Kohler Co.
  - 3. Fixture:
    - a. Standard: ASME A112.19.1/CSA B45.2.
    - b. Style: With front apron and raised back.
    - c. Nominal Size: 28 by 28 inches.
    - d. Color: White.
    - e. Drain: Grid with NPS 3 outlet.
    - f. Rim Guard: Coated wire.



2.3 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.
- B. Sink Faucets: Manual Type, Push Button.
  - 1. Commercial, Solid-Brass Faucets.
    - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - b. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following
      - 1) Chicago Faucets.
  - 2. Standard: ASME A112.18.1/CSA B125.1.
  - 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and sink receptor.
  - 4. Body Material: Commercial, solid brass.
  - 5. Finish: Chrome plated.
  - 6. Maximum Flow Rate:
    - a. Sinks: 1.8 gpm.
    - b. Service Sinks: - gpm
  - 7. Mounting Type: Back/wall, exposed.
  - 8. Vacuum Breaker: Required for hose outlet.
  - 9. Spout Outlet: Hose thread according to ASME B1.20.7.

2.4 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - b. Chicago
- D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Chicago

E. Operation: Loose Key.

## 2.5 SERVICE SINK WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 3 offset and straight tailpiece.
- C. Trap:
  1. Size: NPS 3.
  2. Material: Flat Chrome strainer, cast-brass trap and swivel elbow.

## 2.6 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Locations and Accessibility: Install equipment for ease of maintenance and repair. If changes in the indicated locations or arrangements are made by the Contractor, they shall be made without additional charges.
- B. Openings: Furnish information to the other trades on size and location of openings which are required in walls, slabs, roof, for piping and equipment at the proper times.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Closing-In of Uninspected Work: Do not allow or cause any of the work to be covered up or enclosed until it has been inspected, tested, and approved by the Architect. Any work enclosed or covered prior to such inspection and test shall be uncovered and, after it has been inspected,

tested, and approved, make all repairs with such materials as may be necessary to restore all work, including that of other trades, to its original and proper condition.

### 3.2 INSTALLATION

- A. Install sinks level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-hung sinks.
- C. Install accessible wall-mounted sinks at handicapped/elderly mounting height according to CBC 11B.
- D. Set floor-mounted sinks in leveling bed of cement grout.
- E. Install water-supply piping with stop on each supply to each sink faucet.
  - 1. Exception: Use ball, gate, or globe valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."
  - 2. Install stops in locations where they can be easily reached for operation.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements.
- G. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements.

### 3.3 CONNECTIONS

- A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

### 3.4 ADJUSTING

- A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

### 3.5 CLEANING AND PROTECTION

- A. After completing installation of sinks, inspect and repair damaged finishes.
- B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed sinks and fittings.
- D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

### 3.6 Completion of Installation:

- A. Cleaning and Flushing: Clean all equipment and materials thoroughly. Leave surface to be painted smooth and clean, ready for painting.
- B. Flush each unit of water supply and distribution system thoroughly with clean water at the highest velocities attainable.
- C. Clean all piping, valves, traps, water heaters, fixtures and other devices thoroughly and flush or blow out until free of scale, oil silt, sand, sediment, pipe dope and foreign matter of any kind.

### 3.7 PLUMBING FIXTURES

- A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.
- B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
- C. Fixture controls shall comply with CBC Sections 11B-606.4 for lavatories and sinks.
- D. Accessible sinks shall be 6-1/2" deep maximum. Sinks shall be mounted with front of the higher of the rim and counter surface 34" maximum above the finish floor or ground.
- E. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.

END OF SECTION

SECTION 224233

WASH FOUNTAINS/TROUGH SINKS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Semicircular wash fountains.
- B. Related Requirements:
  - 1. Section 224216.16 "Commercial Sinks."

1.3 QUALITY ASSURANCE

- A. Code Requirements: All work covered by this Section shall conform to the latest requirements of the following regulations:
  - 1. C.C.R., Title 24, Part 5 (2016 CPC).
  - 2. 2016 California Plumbing Code.
  - 3. SMACNA Seismic Restraint Manual Guidelines for Mechanical Systems.
  - 4. National Fire Protection Association.
  - 5. California Division of the State Architect.
  - 6. California State Division of Industrial Safety.
  - 7. County Health Department.
  - 8. Any other legally constituted body-having jurisdiction thereof.
  - 9. Access plumbing fixtures shall comply with all of the requirements of CBC Division 6.
  - 10. Heights and location of all fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
  - 11. Accessible fixture controls shall comply with CBC Sections 11B-611.3 for lavatories and sinks.
  - 12. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34" maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC 11B-306 when forward approach is required CBC Sections 11B-606.3 and 11B606.7.

13. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories or sinks. CBC Section 11B-606.5.

- B. Nothing in the specifications or drawings shall be construed to permit deviation from the requirements of governing codes unless approval for said deviation has been obtained from the legally constituted authorities having jurisdiction and from the Owner's representative.

#### 1.4 DRAWINGS

- A. Because of the small-scale drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The Contractor shall carefully investigate the conditions surrounding installation of his work, furnishing the necessary piping, fittings, valves, traps, and other devices which may be required to complete the installation.
- B. The general arrangement indicated on the drawings shall be followed as closely as possible. Coordinate with the Architectural, Structural, Mechanical and Electrical Drawings and the work of other trades prior to installation of piping fixtures and equipment to verify adequate space available for installation of the work shown. In the event a field condition arises which makes it impossible to install the work as indicated, submit, in writing, the proposed departures to the Architect for his approval. Only when Architect's approval is given, in writing, shall Contractor proceed with installation of the work.
- C. Special Note: Should the Contractor make changes in the installation differing from what is indicated on the contract drawings and not necessitated due to field conditions as indicated hereinabove, the Contractor shall be required to re-install the work to comply with what has been indicated on the contract drawings. Should it be impossible to re-install the work and the installation is in accordance with all governing authorities, the architect may permit the installation to remain. However, all costs incurred to revise the contract drawings by the engineer for resubmittal to the building department indicating the as-installed condition shall become the responsibility of the Contractor.
- D. In case of a difference in the specifications or between the specifications and the drawings, the Contractor shall figure the most expensive alternate and after award of contract, shall secure direction from the Architect.

#### 1.5 PERMITS, INSPECTIONS AND LICENSES

- A. All permits, inspections and licenses required by the legally constituted authorities for installation of the work according to the plans and specifications shall be obtained and paid as a part of the work of this section.

#### 1.6 EXAMINATION OF PREMISES

- A. Before bidding on this work, Contractors shall make a careful examination of the premises and shall thoroughly familiarize themselves with the requirements of the contract. By the act of

submitting a proposal for the work included in this contract, the Contractor shall be deemed to have made such study and examination, and that he is familiar with and accepts all conditions of the site.

#### 1.7 PROTECTION

- A. All work, equipment and materials shall be protected at all times. Contractor shall make good all damage caused either directly or indirectly by his own workmen. Contractor shall also protect his own work from damage. He shall close all pipe openings with caps or plugs during installation. He shall protect all his equipment and materials against dirt, water, chemical and mechanical injury. Upon completion, all work shall be thoroughly cleaned and delivered in a new condition.
- B. Contractor shall be held responsible for all damage to equipment and materials until he has received written notice from the Architect or Engineer that his work has been accepted.

#### 1.8 LOCATIONS

- A. The locations of apparatus, piping and equipment indicated on the drawings are approximate. Piping and equipment shall be installed in such a manner as to avoid all obstruction, preserve headroom, and keep openings and passages clear. The locations of and mounting heights of all fixtures shall be coordinated with the architectural plans and room elevations.
- B. Clearances and Openings: Contractor shall cooperate and coordinate his work with all other trades to avoid conflict and permit for a neat and orderly appearance of the entire installation. The Contractor shall, in advance of the work, furnish instructions to the General Contractor as to his requirements for equipment and material installation of any kind, whether or not specifically mentioned on drawings or in the specifications, and shall include recesses, chases in walls, and all required openings in the structure. Should furnishing this information be neglected, delayed or incorrect and additional cuttings are found to be required, the cost of the same shall be charged to this Contractor.
- C. Contractor shall verify and coordinate pipe routing with location of all electrical rooms, elevator equipment rooms, telecom/data rooms, and other rooms dedicated to the housing of switchgear, panels, or other electrical equipment. In no case shall piping be installed within or above the ceiling of such rooms.

#### 1.9 SUBMITTAL DATA

- A. Submittal Requirements:
  - 1. Furnish, all at one time, prior to any installation, within the time noted below, six (6) copies of valid submittal data on all fixtures, material, equipment and devices. Each submitted item shall be indexed and referenced to these specifications and to identification numbers on fixtures and equipment schedules.

2. Manufacturers' submittal literature and shop drawings are required on all items to ensure the latest and most complete manufacturer's data is available for review. Requirements of the submittals and Engineer's submittal notes are a part of the work of this Division except that Engineer's notes may not be used as a means of increasing the scope of work of this Division.
3. Submittals will be checked for general conformance with the design concept of the project but the review does not guarantee quantities shown and does not supersede requirements of this Division to properly install work.
4. To be valid, all submittals must:
  - a. Be delivered to the Architect's office within thirty-five (35) days of award of the contract. Contractor shall make time allowance for Engineer's review, return of comments, if any, and resubmittal if required. Corrections or changes in submittals returned as inadequate or incomplete shall be accomplished within this time limit.
  - b. Clearly indicate and label as such any items proposed as substitution for that specified or shown on plans.
  - c. Include all pertinent construction, installation, performance and technical data.
  - d. Have all product data sheets clearly labeled to indicate the individual items being submitted. In addition, all required options and accessories shall be clearly marked.
    - 1) Product data sheets corresponding to items indicated on plans shall be clearly labeled with the corresponding fixture or equipment tag number.
    - 2) Product data sheets corresponding to items indicated in specifications shall be clearly labeled with the specification section, page and item numbers.
  - e. Include, for every item which differs in size, configuration, connections, service, accessibility or any other significant way, a drawing to the same (or larger) scale as to the pertinent portions of the contract drawings. In this drawing show a complete layout of the system except that which is identical to the contract drawings, unless the unchanged portions must be shown to indicate such things as clearances. This drawing, together with the contract design drawings must show the complete system as revised to accommodate the proposed alternate.

B. Substitution Requirements:

1. Any items included in submittals and proposed by the Contractor as substitution for that specified or shown on plans shall be submitted within thirty five (35) days of award of the contract. After such time, proposed substitutions shall not be accepted for review, and the Contractor shall submit all items as specified or shown on plans.
  - a. For each item proposed as substitution for that specified or shown on plans, copies of product data sheets for the specified item shall be placed side by side with product data sheets for the proposed substitution item within the submittal.
    - 1) In addition to the Submittal Requirements for labeling listed above, product data sheets for the specified item shall be clearly labeled "SPECIFIED ITEM, NOT SUBMITTED". Product data sheets for the corresponding proposed substitution item shall be clearly labeled "PROPOSED SUBSTITUTION".



- b. Provide calculations and other detailed data justifying how any items proposed as substitution were selected for proposal. Data must be complete enough to permit detailed comparison of every significant characteristic for which the specified item was analyzed during design.
- 2. It shall be the Contractor’s responsibility to provide sufficient information to allow the Engineer to analyze any proposed alternate. If inadequate information is provided, the proposal will not be approved and resubmittal will not be allowed.
- 3. The Contractor shall provide or perform tests required by Engineer for purpose of judging acceptability of proposed substitutions.
- 4. The Contractor assumes full responsibility that alternate items and procedures will meet the job requirements and is responsible for cost of redesign and of modifications to this and other parts of work caused by alternate items furnished under work in this Section. In view of these responsibilities, it is the purpose of these specifications to establish procedures to ensure that the Contractor has considered all the ramifications of proposed alternates before submitting them for review. Submittals which do not comply with the requirements of these specifications or which indicate proposed alternates that were selected without proper regard to the requirements of the job will not be approved. No more than one proposed alternate will be considered for each item.
- 5. Alternate items installed without Engineer's approval will be replaced with specified items at Contractor's expense.
- 6. The Architect or his authorized representative shall be the sole judge as to the quality and suitability of proposed alternate equipment, fixtures or materials. Decisions of the Architect or that of his representative shall be final and conclusive.

1.10 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wash fountains and components to include in operation and maintenance manuals.

1.11 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Faucet Washers and O-Rings: Equal to 10 percent of quantity of each type and size installed.
  - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of quantity of each type and size installed.

PART 2 - PRODUCTS

2.1 STAINLESS-STEEL, SEMICIRCULAR WASH FOUNTAINS

- A. Wash Fountains: Off-floor, stainless-steel, semicircular receptor.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Acorn Engineering Company; Wash-Ware 3401ES – 3 stations.
  - b. Bradley Corporation.
3. Standard: IAPMO IGC 156.
4. Receptor:
  - a. Standard: ASME A112.19.3/CSA B45.4 for stainless-steel receptor.
  - b. Nominal Diameter: 48 inches.
  - c. Height to Rim: See Architectural Drawings.
  - d. Color or Finish: Not applicable.
  - e. Drain: Grid with NPS 1-1/2 tailpiece.
5. Spray Head:
  - a. Material: Stainless steel or integral part of receptor back.
  - b. Number of User Stations: Three.
  - c. Spray Nozzles: Chrome-plated brass or stainless steel complying with NSF 61 and ASME A112.18.1/CSA B125.1.
    - a. Control: Individual push-button actuation.
    - b. Sensor: ASME A112.18.1/CSA B125.1 and UL 1951.
6. Supply Fittings:
  - a. Piping: NPS 1/2 copper tubing.
  - b. Valves: Shutoff valve on each supply.
  - c. Supply Piping: From wall.
7. Waste Fittings:
  - a. Standard: ASME A112.18.2/CSA B125.2.
  - b. Trap and Drain Piping: NPS 1-1/2.
  - c. Vent Piping: NPS 1-1/2 to ceiling.
8. Shroud: Not required.
9. Off-Floor Mounting: Wall bracket and ASME A112.6.1M, Type II urinal carrier.
  - a. Supplies: [PS 1/2 copper tubing with ball, gate, or globe valves.
  - b. Drain: Grid with NPS 1-1/2 tailpiece.
  - c. Drain Piping: NPS 1-1/2 P-trap, waste to wall, and wall flange.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine roughing-in of water-supply, sanitary drainage, and vent piping systems to verify actual locations of piping connections before wash-fountain installation.
- B. Examine walls and floors for suitable conditions where wash fountains will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Install wash fountains level and plumb according to roughing-in drawings.
- B. Set freestanding wash fountains on 4-inch thick concrete pad
- C. Install off-floor carrier supports, affixed to building substrate, for wall-mounted wash fountains.
- D. Install accessible, wall-mounted wash fountains at mounting height for handicapped/elderly according to CBC 11b.
- E. Install water-supply piping with shutoff valve on each supply to each wash fountain to be connected to domestic-water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."
- F. Install trap and waste piping on each drain outlet of each wash fountain to be connected to sanitary drainage system.
- G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements.
- H. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements.

## 3.3 CONNECTIONS

- A. Connect wash fountains with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with requirements for water piping specified in Section 221116 "Domestic Water Piping."
- C. Comply with requirements for soil and waste drainage piping and vent piping specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust wash fountains and controls. Replace damaged and malfunctioning wash fountains, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.
- C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

- A. After installing wash fountains, inspect and repair damaged finishes.
- B. Clean wash fountains, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed wash fountains and fittings.
- D. Do not allow use of wash fountains for temporary facilities unless approved in writing by Owner.

END OF SECTION



## Wash-Ware® 3401ES Series

Elliptical Contoured Base Models - 1, 2 or 3 Stations



3403ES-1-H

Fixture May Show Some Available Options

Please visit [www.acorneng.com](http://www.acorneng.com) for most current specifications.

### Elliptical Contoured Base Models - 1, 2 or 3 Stations

**Bowl** is 14 gage type 304 stainless steel with satin finish and has an integral backsplash and sprayhead. Heavy-duty S-clips securely anchor the backsplash to the wall. Sprayhead has self-draining, air-circulating soap holders.

**Standard Housing** is a contoured pedestal fabricated of 16 gage, type 304 stainless steel with satin finish. Housing includes a flush mounted access cover for easier installation and servicing of unit.

**Sectional Control** is standard. One pushbutton or sensor actuates one station.

**Hand Pushbuttons** (suffix option -H) operate metering non-hold open Air-Control Valves and can be field set for flow ranging from 5 to 60 seconds.

**Electronic Sensor Operation** (suffix option -SO) includes individual solenoid valves activated by infrared sensors. Sensor operation provides 30 seconds of flow once activated. A low voltage transformer is provided.

**Spray Nozzles** are vandal-resistant and provide a concentrated 0.5 GPM spray at each station.

**Hot & Cold Supplies** are blended in an ASSE 1070 compliant temperature/pressure balancing mixing valve with integral checks and strainers. A minimum of 30 PSI supply pressure is required.

**Waste Connection** is a 1-1/2" OD x 4" tailpiece.

### GUIDE SPECIFICATION

Provide and install Acorn Washfountain (specify model number and options) factory pre-assembled, with individual sectional control. Bowl shall be 14 gage stainless steel and shall have an integral backsplash with vandal-resistant spray nozzle(s) and 0.5 GPM flow control(s). Provide self-draining, air-circulating soap holders on top of sprayhead. On-Floor and Off-Floor Models shall have backsplash and housing framework anchored to wall. The wall shall be structurally reinforced to support the fixture. Standard base On-Floor Models shall have additional floor anchoring. Provide an ASSE 1070 compliant temperature/pressure balancing mixing valve with integral checks and strainers in H & C supply and field set water temperature at 105 degree Fahrenheit. When hand operated non-hold open metering valves are specified, timing cycle shall be field set for approximately (specify) seconds.



# Wash-Ware®: 3401 Elliptical Contoured Models -1, 2, or 3 Stations

## MODEL NUMBER AND OPTIONS SELECTION

### BASE MODEL NUMBERS (Must Specify)

- 3401-ES Elliptical with Contoured Base, One Station
- 3402-ES Elliptical with Contoured Base, Two Station
- 3403-ES Elliptical with Contoured Base, Three Station

### FIXTURE MOUNTING AND WASTE (Must Specify)

(1-1/2" OD Tailpiece Provided Standard)

- 1 Off-Floor, Wall Outlet
- 2 On-Floor, Wall Outlet

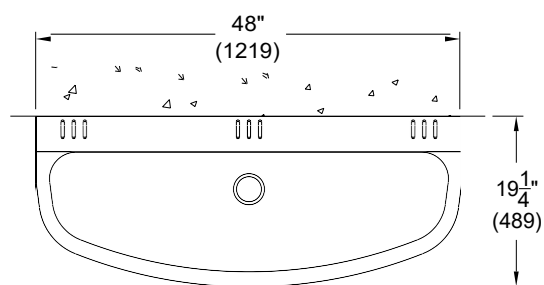
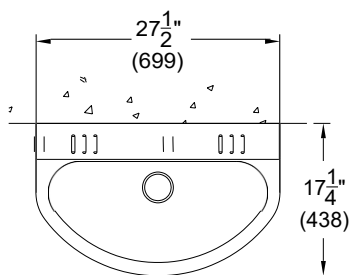
### OPERATION (Must Specify)

- -H Hand Operation
- -PPZ Programmable Piezo Pushbutton Electronic Metering
- -SO Sensor Operation
- -SO-BAT Sensor Operation (Batteries Not Included)

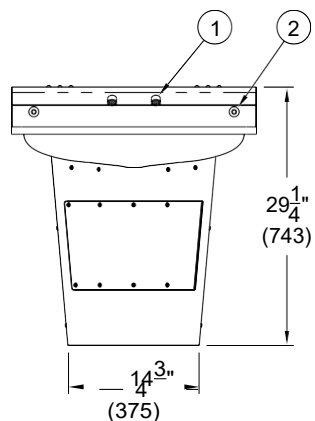
### PRODUCT OPTIONS (Must Specify)

- -EG Enviro-Glaze Color, Bowl and Sprayhead  
Specify: \_\_\_\_\_
- -HB Hose Bibb, Specify: ○ Left Side ○ Right Side
- -JH31 31" Junior Rim Height (Not ADA Compliant)
- -ST Single Temperature Valve

Please visit [www.acorneng.com](http://www.acorneng.com) for most current specifications.

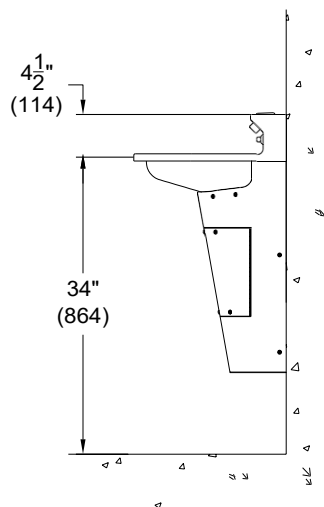


3403ES



NOTES:  
 1. Spray Nozzle.  
 2. -H Pushbutton.

3402ES-1-H



<b>Important:</b> Installation instructions and current rough-in are furnished with each fixture. Do not rough in without certified dimensions. Dimensions are subject to manufacturer's tolerance of plus or minus 1/4" and change without notice. Acorn assumes no responsibility for use of void or superseded data. © Copyright 2006 Acorn Engineering Company	
<p style="text-align: center;">Selection Summary</p> <p>Model No. &amp; Option _____</p> <p>Quantity _____</p>	<p style="text-align: center;">Approved for Manufacturing</p> <p>Company _____ Title _____</p> <p>Signature _____ Date _____</p>

SECTION 224713

DRINKING FOUNTAINS

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 drinking fountains and related components.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of drinking fountain.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For drinking fountains to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 DRINKING FOUNTAINS

- A. Drinking Fountains: Stainless steel, floor mounted.
  - 1. Stainless-Steel Drinking Fountains:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Elkay Manufacturing Co.
      - 2) Haws Corporation.
    - 2. Type Receptor: On horizontal support.
    - 3. Bubblers: Two, with adjustable stream regulator, located on deck.
    - 4. Control: Push button.
    - 5. Drain: Grid type with NPS 1-1/4 tailpiece.

6. Supply: NPS 3/8 with shutoff valve.
7. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/2 P-trap and waste.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
- B. Examine walls and floors for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- B. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."
- C. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

#### 3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Install ball, gate, or globe shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."
- D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

#### 3.4 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.



### 3.5 CLEANING

- A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
- C. Provide protective covering for installed fixtures.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

### 3.6 PLUMBING FIXTURES

- A. Accessible plumbing fixtures shall comply with all of the requirements of CBC Division 6.
- B. Heights and location of all accessible fixtures shall be mounted according to CBC Sections 11B-602 through 11B-612.
- C. Fixture controls shall comply with CBC Sections 11B-601.3 for drinking fountains.

END OF SECTION

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SECTION 260501 - GENERAL ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the general requirements for Division 26 - Electrical.
  - 1. Division 1 and the General Conditions apply to all work of this section.
  - 2. Division 26 supplements the applicable requirements of other Divisions.
  
- B. The Work includes all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with furnishing, delivery and installation of the work of this division, complete, as shown on the drawings and/or specified herein.
  - 1. Examine all divisions for related work required to be included as work under this division.
  
- C. Owner-furnished items: Pick up Owner-furnished items and handle, deliver, install, and make all final connections.
  - 1. Assume responsibility for the items when consigned at the storage facility in accord with requirements of the Contract Documents.

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.
  
- B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:
  - 1. ANSI American National Standards Institute
  - 2. ASTM American Society for Testing and Materials
  - 3. IEEE Institute of Electrical and Electronics Engineers
  - 4. NEC National Electrical Code (NFPA 70)
  - 5. NEMA National Electrical Manufacturers Association
  - 6. NFPA National Fire Protection Association
  - 7. UL Underwriters Laboratories, Inc.
  - 8.  BC California Building Code (2016)

1.3 QUALITY ASSURANCE

- A. Regulation: All the electrical equipment and materials, including their installation, shall

conform to the following latest applicable codes and standards:

1. National Electrical Code (NEC).
2. California State Fire Marshal.
3. Occupational Safety and Health Act (OSHA).
4. Requirements of Serving Utility Companies.
5. Local Codes and Ordinances.
6. Requirements of the California Division of the State (DSA).
7. California Administrative Code, Title 8, Chapter 4, Industrial Safety Orders.
8. California Administrative Code, Title 24.
9. Variances: In instances where two or more codes are at variance, the most restrictive requirement shall apply.

- B. Contractor's Expense: Obtain and pay for all required bonds, insurance, licenses, and pay for all taxes, fees and utility charges required for the electrical work.

#### 1.4 SUBMITTALS

- A. Submit all of the items described in Paragraphs 1, 2, and 3 (below) as a single submittal. Partial submittals will not be accepted. Contractor shall review submittals for conformance with Contract Documents, and make necessary revisions. Contractor shall also verify dimensions of equipment and be satisfied as to fit and that they comply with all code requirements relating to adequacy and clear working space. Submit the following in accordance with Division 1, with the additional electrical systems-related document requirements and additional number of copy sets as specified below:

1. Detailed shop drawings and associated product data/material lists (also see applicable technical specification sections following for additional requirements), six submittal document sets, for:
  - a. Medium voltage switchgear
  - b. Substations
  - c. Switchboards
  - d. Panelboards
  - e. Engine generator systems
  - f. Motor control centers
  - g. Lighting control equipment
  - h. Fire alarm system
  - i. Public address/sound systems
2. Contractor shall submit shop drawings sealed by a Structural Engineer registered in the State of California to demonstrate compliance with the following:
  - a. Component Anchorage Requirements:
    - 1) All mechanical, plumbing, and electrical components shall be anchored and installed per the details on the DSA approved construction documents. Where no detail is indicated, the following components shall be anchored

or braced to meet the force and displacement requirements prescribed in the 2016 CBC Sections 1616A.1.26 and ASCE 7-10 Chapter 13, 26 and 30:

- a) All permanent equipment and components.
  - b) Temporary or movable equipment that is permanently attached (e.g. hard wired) to the building utility services such as electricity, gas or water.
  - c) Movable equipment which is stationed in one place for more than 8 hours and heavier than 400 pounds are required to be anchored with temporary attachments.
- 2) The attachments of the following mechanical and electrical components shall be positively attached to the structure but need not be detailed on the plans. These components shall have flexible connections provided between the component and associated ductwork, piping and conduit:
- a) Components weighing less than 400 pounds and have a center of mass located 4 feet or less above the adjacent floor or roof level that directly support the component.
  - b) Components weighing less than 20 pounds, or in the case of distributed systems, less than 5 pounds per foot which are suspended from a roof or floor or hung from a wall.
- 3) For those elements that do not require details on the approved drawings, the installation shall be subject to the approval of the Structural Engineer of Record and the DSA District Structural Engineer. The project inspector will verify that all components and equipment have been anchored in accordance with above requirements.
- b. Piping, Ductwork, and Electrical Distribution System Bracing requirements:
- 1) Piping, ductwork, and electrical distribution systems shall be braced to comply with the forces and displacements prescribed in ASCE 7-10 Section 13.3 as defined in ASCE 7-10 Section 13.5.3, 13.6.7, 13.6.8 and 2017 CBC, Sections 1616A.1.23, 1616A.1.24, 1616A.1.25 and 1616A.1.26.
  - 2) The method of showing bracing and attachments to the structure for the identified distribution system are as noted below. When bracing and attachments are based on a preapproved installation guide (e.g. OSHPD OPM), copies of the bracing system installation guide or manual shall be available on the jobsite prior to the start of and during the hanging and bracing of the distribution systems. The structural engineer of record shall verify the adequacy of the structure to support the hanger and brace loads.
  - 3) Electrical distribution systems shall be detailed on the approved drawings with the project specific notes.
3. Product data/material lists (also see applicable technical specification sections following for additional requirements), at least six submittal document sets, for:

- a. Raceways
- b. Underground duct and fittings
- c. Precast concrete pullboxes
- d. Building wire and cable
- e. Medium voltage cable
- f. Cabinets, boxes and fittings
- g. Wiring devices
- h. Grounding components
- i. Supporting devices
- j. Nameplates and identification markers/labels
- k. Enclosed circuit breakers
- l. Overcurrent protective devices
- m. Enclosed switches
- n. Enclosed transfer switches
- o. Enclosed motor controllers
- p. Transformers
- q. Lighting fixtures and associated equipment
- r. Lighting system control equipment and devices
- s. Lighting system control equipment and devices

#### 4. Substitutions

Catalog numbers and specific brands or trade names followed by designation "or equal" are used in conjunction with material and equipment required by the Specifications to establish the standards of quality, utility, and appearance required. Substitutions which are equal in quality, safety, and appearance to those specified may be accepted, subject to the following provisions:

- a. All substitutions must be submitted in writing to the Owner. Contractor shall submit to the Owner a typewritten list containing a description of each proposed substitute material or equipment.
- b. The Owner will accept, in writing, proposed substitutions that are, in the Owner's opinion, equal in quality, utility and appearance to the material or equipment specified. Such acceptance shall not relieve Contractor from complying with the requirements of the Drawings and the Specifications.
- c. Contractor shall be responsible for all costs of any changes resulting from Contractor's proposed substitutions which affect other parts of the Work or the work of separate Contractors.
  - 1) Contractor also agrees to compensate the Owner for time and expenses spent reviewing substitutions.
- d. The decision of the Owner shall be final.

5. Submit protective device coordination and short circuit calculations conducted and documented to demonstrate: (1) selective coordination, and (2) that electrical equipment and protective devices proposed provide adequate interrupting and withstand capability. The written calculation procedures and tabulated results shall be bound and submitted -

- six submittal document sets. Section 26 0573 "Protective Device Coordination and Short Circuit Study", is applicable as included in these Specifications.
6. Submit test results (also see applicable technical specification sections following for additional requirements), six submittal document sets, for:
    - a. Transformers
    - b. Ground fault protection coordination
    - c. Fire alarm system
    - d. Public address/sound system
  7. Submit operating, maintenance and instructional data (also see applicable technical specification sections following for additional requirements), six submittal document sets, for:
    - a. Switchboards
    - b. Transfer switches
    - c. Fire alarm system
    - d. Public address/sound system
  8. Instruction Materials (also see applicable technical specification sections following for additional requirements), six submittal document sets, for:
    - a. Provide prior to the time of the personnel instruction period, instruction manuals associated with all systems listed above.
    - b. Include the following information, as a minimum, in each copy of the instruction manual:
      - 1) Manufacturers' names and addresses.
      - 2) Serial numbers of items furnished.
      - 3) Catalog cuts, exploded views and brochures, complete with technical and performance data for all equipment, marked to indicate actual items furnished and the intended use.
      - 4) Recommended maintenance procedures.

B. Project record documents:

1. Mark Record Documents daily to indicate all changes made in the field.
  - a. In addition to general requirements of Record Documents, indicate on Project Record Drawings all changes of equipment locations and ratings, fuse sizes, trip sizes and settings on magnetic-only circuit breakers.
  - b. Alterations in raceway runs and sizes, changes in wire sizes, circuit designations, installation details, one line diagrams, control diagrams and schedules.
2. Use green to indicate deletions and red to indicate additions.
  - a. Use the same symbols and follow as much as possible the same drafting procedures used on the Contract Drawings.

3. Locate conduit stubbed-out for future use, underground feeder conduits, and feeder pull box locations using building lines by indicating on the Project Record Drawings.

1.5 OPERATING AND MAINTENANCE MANUALS

- A. Prepare and submit Operating and Maintenance Manuals, six document sets. In addition to the requirements specified in Division 1 (also see technical specification sections following for additional requirements), include the following information for equipment items:
  1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers and replacement parts.
  2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and, as required, summer and winter operating instructions.
  3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
  4. Servicing instructions and lubrication charts and schedules.

1.6 QUALITY ASSURANCE

- A. As a minimum Specification requirement, all materials and methods shall comply with applicable governing codes.
- B. Material and equipment substitution.
  1. Equipment other than that specified will be accepted only when written approval is given by the Owner, in accordance with Division 1.
  2. The Contractor shall be held responsible for all physical changes in piping, equipment, etc. resulting from equipment substitution and likewise bear any increased cost of other trades in making said substitution. Approval by the Owner of equipment other than that specified does not relieve the Contractor of this responsibility.

1.7 OWNER'S INSTRUCTIONS

- A. Prior to completion of the contract, and at the Owner's convenience, instruct verbally and demonstrate to the Owner's personnel, the operation of the systems as listed in Part 1 above.

1.8 SYSTEM STARTUP

- A. Do not energize or place electrical equipment in service until all relevant parties have been duly notified and are present or have waived their rights to be present. Where equipment to be placed in service involves service or connection from another contractor of the Owner, notify the Owner in writing when the equipment will be ready. Notify the Owner's Representative two weeks in advance of the date the various times of equipment will be complete.

PART 2 - PRODUCTS Not Used



PART 3 - EXECUTION

3.1 EXAMINATION

- A. Site verification of conditions: Contractor shall survey the entire project site and become thoroughly familiar with actual existing conditions. The intent of the work is shown on the drawings and described hereinafter. By the act of participation in the pre-bid conference and site inspection tour specified in the applicable Division 1 section, the Contractor shall be deemed to have made such a study and examination and to accept all conditions present at the site. No request for additional payment shall be considered as valid, due to failure to allow for conditions which may exist.
- B. Electrical work shown: Electrical drawings are generally diagrammatic. Verify equipment sizes with shop drawings and manufacturers' data and coordinate location layout with other trades. Report immediately to the Owner any conflicts in the drawings and specifications with any code or between the electrical work and the work of other trades. No work shall be commenced where a conflict exists prior to receiving proper instructions. Any work or materials shown on the drawings and not mentioned in this division, or vice-versa, shall be executed the same as if specifically mentioned by both. Notify the Owner of any changes of location requirements prior to installation.

3.2 SEISMIC BRACING

- A. Contractor shall be responsible for anchors and connections of electrical work to building structure, per DSA approved plans, to prevent damage as a result of earthquake, including manufactured equipment, the connection and integrity of shop-fabricated and field-fabricated materials and equipment. All building equipment and connections therefore shall be designed to resist seismic forces in conformance with Title 24 of the California Administrative Code.

Reference section 1.4.A.2 of this specification section.

3.3 PENETRATION SEALING

- A. Seal penetrations through exterior walls and fire rated walls, floors, and ceilings. Sealing methods used shall be in compliance with the requirements of the Authority Having Jurisdiction to maintain required fire ratings, and shall be in accordance with the applicable sections in Division 7 which prescribe applicable firestopping and weatherproofing of wall, floor, ceiling, and roof penetrations. Seal all conduit penetrations through roofs.

3.4 DEMOLITION, ALTERATION AND EXTENSION WORK

- A. Provide and perform demolition, alteration, extension, preparatory and miscellaneous work as indicated.
- B. Existing Conditions: Make a detailed survey of the existing conditions pertaining to the work. Check the locations of all existing structures equipment, wiring, etc. include all demolition, alteration and extension work in bid.

### 3.5 SERVICE INTERRUPTIONS AND UTILITY

- A. Coordinate with the Owner any interruption of services necessary to accomplish the work.
- B. Coordinate with the utility company all work associated with power and communications/signal distribution systems and service entrance equipment.

### 3.6 FIELD QUALITY CONTROL

#### A. Site Tests:

1. Perform all necessary tests required to ascertain that the electrical system has been properly installed, that the power supply to each item of equipment is correct, and that the system is free of grounds, ground faults, and open circuits, that all motors are rotating in the proper directions, and such other tests and adjustments as may be required for the proper completion and operation of the electrical system.
2. Test the input and output voltage of each transformer prior to operation under load, and adjust the output voltage by resetting taps, to achieve the specified values. After the system has been placed under load, test transformers under normal operation. Record the measurement of primary and secondary voltages. Reset taps to within 1/2% if necessary to adjust secondary voltage. Submit a report indicating the final result of such tests, and reporting specific current and voltage measurements to the Owner's Representative.
3. If, during the course of testing, it is found that system imbalance is in excess of 20%, rearrange single-pole branch circuits in lighting and receptacle panels to bring system balance within 20% on all phases. Record all such changes on the panelboard schedule and submit a summary of changes to the Owner's Representative.

### 3.7 CLEANING

- A. Clean exterior surfaces of equipment and remove all dirt, cement, plaster and other debris. Protect interior of equipment from dirt during construction and clean thoroughly before energizing.
- B. Clean-out cracks, corners and surfaces on equipment to be painted, remove grease and oil spots so that paint may be applied without further preparation.
- C. Locate underground conduit stubbed-out for future use, underground feeder conduits, and feeder pull box locations, using building lines by indicating on the Project Record Drawings.

END OF SECTION 260501

## SECTION 260519- LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes wire and cable systems rated 600 volts and less:
1. Building wire and cable.
  2. Underground feeder and branch circuit cable.
  3. Service entrance cable.
  4. Armored cable
  5. Metal-Clad cable.
  6. Nonmetallic-sheathed cable.
  7. Wiring connectors and connection accessories.
- B. Cabling requirements in this Section may be supplemented in other sections of these specifications.
- C. Related Sections:
1. General electrical requirements: Section 260501.

## 1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.
- B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:
1. ANSI American National Standards Institute
  2. ASTM American Society for Testing and Materials.
  3. Institute of Electrical and Electronics Engineers.  
IEEE Standard 82 Test Procedures for Impulse Voltage Tests on Insulated Conductors.
  4. NEC National Electrical Code (NFPA 70).
  5. NECA National Electrical Contractors Association: "Standard of Installation."
  6. National Electrical Manufacturers Association/Insulated Cable Engineers Association  
NEMA/ICEA WC-5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.  
NEMA/ICEA WC-7 Cross-Linked Thermosetting Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.  
NEMA/ICEA WC-8 Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
  7. NFPA National Fire Protection Association
  8. Underwriters Laboratories, Inc.  
UL 4 Armored Cable

- UL 62 Flexible Cord and Fixture Wire.
- UL 486A Wire Connectors and Wiring Lugs for Use with Copper Conductors
- UL 486B Wire Connectors for Use with Aluminum Conductors
- UL 83 Thermoplastic-Insulated Wires and Cables.
- UL 854 Service Entrance Cables.

1.3 SUBMITTALS

- A. General: Submit the following in accordance with the Conditions of the Contract and Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Samples: Provide samples upon specific request.
- C. Product Data: Submit product data giving complete description for sizes employed, material types, and electrical ratings.
- D. Certificates:
  - 1. Labels of Underwriters' Laboratories, Inc., fixed to each item of material.
  - 2. If materials are by manufacturers other than those specified submit certification that material meets applicable Underwriters' Laboratories, Inc. Standards.
  - 3. Submit in accordance with Section 260501.

1.4 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation."
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.
- C. Deliver wire and cable to the project in full unbroken cartons or reels marked with conductor

size, insulation type, and Underwriters' Laboratories, Inc. label.

- D. Handle wire and cable in a manner to prevent damage to conductor, insulation and identifying markings.

1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of wiring system prior to rough-in.
- C. Wire and cable routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Subject to compliance with requirements, provide products by the following, or equal:

- A. Wire and cable:
  - Triangle
  - Anaconda
  - General Cable Corporation
- B. Connectors:
  - AMP
  - Buchanan
  - Burndy
  - 3M Company
  - O-Z/Gedney
  - Thomas & Betts
- C. Insulating Tapes: 3M Company
- D. Wire Ties:
  - Ideal
  - Thomas and Betts ("Ty-Rap")
  - Panduit
- E. Pulling Compound: Ideal ("Yellow 77").

2.2 MATERIALS

- A. General: Provide wire and cable suitable for the temperature, conditions, and location where installed, except as otherwise indicated.

1. Conductor: Copper. Provide solid conductor for No. 10 AWG and smaller. Provide stranded conductors for sizes No. 8 and larger.
    - a. Use stranded conductors:
      - 1) At motors and other applications where subject to vibration.
      - 2) For control circuits.
  2. Minimum Size Conductor: No. 12 AWG, except as otherwise indicated.
    - a. Control circuits: No. 14 AWG.
  3. Insulation voltage rating: 600 volts.
- B. Building wire and cable:
1. Description: Single conductor insulated wire.
  2. Insulation: ANSI/NFPA 70:
    - a. Type THHN/THWN, rated 75 degrees C.
    - b. Type XHHW, rated 90 degrees C.
- C. Service entrance cable:
1. Description: ANSI/NFPA 70. Type USE.
  2. Insulation: Type RHW.
- D. Armored cable:
1. Description: ANSI/NFPA 70. Type AC.
  2. Insulation: Thermoplastic, 75 degrees C.
- E. Metal-Clad cable:
1. Description: ANSI/NFPA 70. Type MC.
  2. Insulation: Thermoplastic, 75 degrees C.
  3. Armor material: Steel.
  4. Armor design: Interlocked metal tape.
  5. Jacket: None.
- F. Nonmetallic-sheathed cable: ANSI/NFPA 70. Type NM and NMC.
- G. Flexible cord and cable: ANSI/NFPA 70. Type SO.
- H. Connectors:
1. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

- I. Pull Cord: 1/8" polypropylene or nylon.

### PART 3 - EXECUTION

#### 3.1 WIRING METHOD

##### A. General:

1. Use insulation types suitable for the temperature, moisture and elements to which exposed.
  - a. Minimum 75°C temperature rated insulation on conductors, except as otherwise indicated.
    - 1) Use minimum 90°C temperature rated insulation on conductors in conduits exposed on roof, or where required due to ambient temperature.
2. Equipment grounding conductors:
  - a. Provide where required by the National Electrical Code, and where indicated. Where conductor size is not indicated, provide size as required by the National Electrical Code.
  - b. Provide for:
    - 1) All branch circuit wiring.
    - 2) All feeders and motor branch circuits
    - 3) All nonmetallic conduits.
    - 4) All flexible metal conduits exceeding 72 inches in length.
3. Use flexible cords and cables for connection of special equipment as indicated. Length not to exceed 72 inches.

##### B. Wire and cable connections:

1. Connector types:
  - a. No. 10 AWG wire and smaller: Spring-type connectors. All terminations shall be made on device terminals or on terminal blocks.
    - 1) Maximum number of conductors in a connection: 3.
  - b. No. 8 AWG wire and larger: Compression- or pressure-type solderless connectors and terminal lugs. Wrap connection with electrical insulating tape, half-lapped to produce a dielectric value equal to or greater than wire insulation.
2. Provide connector sealing packs for splices that require complete protection from dampness and water where indicated.
3. Splices in feeders and mains may only be made where designated on the drawings and where prior approval is obtained from Owner.

4. Location of splices and terminations shall be limited to accessible locations such as outlet boxes, pull boxes, junction boxes, panelboard boxes, and splice boxes.
5. Insulate taps and splices equal to insulation of adjoining conductor.
6. Splice or tap permitted only on conductors that are a component part of a single circuit properly protected by approved methods.

### 3.2 PREPARATION

- A. Examine the system in which the wire is to be installed for defects in equipment and installation which may cause damage to the wire.
- B. Examine wires to be jointed, tapped, spliced, terminated, and their connecting devices for defects which may affect the mechanical and electrical integrity of the connection.
- C. Check conduit systems for damage and loose connections, replace damaged sections. Make sure that the inside of conduit is free of dirt and moisture.
  1. Completely and thoroughly swab raceway before installing wire.
  2. Pull mandrel, one size smaller than the conduit, through entire length of all underground conduits prior to conductor installation.
- D. Do not start work until defects have been corrected and until authorization to proceed has been obtained from Owner's Representative.

### 3.3 INSTALLATION

- A. Install wire, cable, and connectors in compliance with the NEC.
- B. Install products in accordance with manufacturers instructions.
- C. Install all wire in raceway.
- D. When pulling conductors do not exceed manufacturer's recommended values.
- E. Use polypropylene or nylon ropes for pulling conductors.
- F. Do not bend wire less than the manufacturer's recommended minimum bending radius.
- G. Coordinate cable installation with other work.
- H. Protect exposed cable from damage.
- I. Support cables above accessible ceiling, using spring metal clips or cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- J. Use suitable cable fittings and connectors.
- K. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound where necessary.



- L. Use pulling means including fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.
- M. Conceal all cable in finished spaces.
- N. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours, where possible.
- O. Keep conductor splices to a minimum.
- P. Clean conductor surfaces before installing connectors.
- Q. Tape uninsulated conductors and connectors with electrical insulating tape to 150 percent of insulation rating of conductor.
- R. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced.
- S. Use splice and tap connectors which are compatible with conductor material.
- T. Provide adequate length of conductors within electrical enclosures and neatly train the conductors to terminal points with no excess. Make terminations so there is no bare conductor at the terminal.
- U. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque-tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A.
- V. Circuits of multiple phases passing through enclosures shall have phases grouped (bundled together) to reduce the reactance effect.
- W. Arrange conductors in switchboards, panelboards, gutters, boxes, control cabinets and terminal cabinets neatly and lace with black T & B "Ty-Raps" ties.
- X. Connect control circuits as indicated and in accordance with the wiring diagrams furnished by the equipment manufacturer. Control conductors shall be color coded or identified with the provision of non-deteriorating type wire markers.
- Y. Consistently color code wiring continuous throughout the work:
  - 1. Color code secondary service, feeder, and branch circuit conductors with insulation/jacket (factory-applied) color for phase identification as follows:

-- System Voltage --		
<u>Phase</u>	<u>208Y/120</u>	<u>480Y/277</u>
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

2. Select consistent wiring color code for switch legs, travelers, and special systems.
3. For conductors No. 6 AWG or larger, permanent plastic colored tape may be used to mark conductor in lieu of color-coded insulation/jacket. Tape shall cover not less than 2 inches of conductor insulation within enclosures.

### 3.4 IDENTIFICATION

A. In addition to requirements in Section 260553, the following are applicable:

1. At all switchboard terminations, provide each feeder circuit with a permanent plastic name tag indicating the load fed.
2. Feeders: Identify with the corresponding circuit designation at over-current device and load ends, at all splices and in pull boxes.
3. Branch Circuits: Identify with the corresponding circuit designation at the over-current device and at all splices and devices.
4. Control Wires: Identify with the indicated number and/or letter designation at all terminal points and connections.
5. Alarm and Detection Wires: Identify with the indicated wire and zone numbers at all connection, terminal points, and coiled conductors within cabinets.
6. Conductors Terminated by Others: Indicate location of opposite end of conductor, i.e., Pull Box-Room 101.
7. For identification of conductors use plastic coated self-sticking markers such as Thomas & Betts E-Z Code.
8. Circuit Designation is construed to mean panel designation and circuit number, i.e., LA-13.

### 3.5 FIELD QUALITY CONTROL

A. Prior to energizing:

1. Inspect wire and cable for physical damage and proper connection.
  - a. Confirm that field-connections made by others in equipment furnished by others are mechanically and electrically sound prior to energization.
2. Confirm electrical continuity and absence of short circuits for all wire and cable with the use of a megohm meter.
  - a. Obtain values for phase-to-phase, phase-to-neutral, and phase-to-ground.
3. Confirm required insulation resistance as follows:

- a. Perform insulation resistance test for all 600 volt insulated conductors No. 8 AWG and larger.
- b. Use a 500 volt megger.
- c. Obtain and record values for insulation resistance to ground and for insulation resistance between each conductor and every other conductor in the same conduit.
- d. Conductors not complying with the following minimum values of insulation resistance are to be replaced and retested until satisfactory.

Conductor Rated Amperes:	Minimum Insulation Resistance, Ohms:
31 through 50	500,000
51 through 100	250,000
101 through 200	100,000
201 through 400	50,000

- e. Perform tests after conductors have been installed, but before terminal connections have been made. Take readings for each test after the voltage has been applied continuously for one minute.
- f. Perform tests according to manufacturer's recommendations.
- g. Test results shall be in accordance with manufacturer's recommendations.
- h. Correct defects revealed by above tests.

B. Subsequent to wire and cable hook-ups:

- 1. Energize circuits and demonstrate proper functioning. Correct malfunctioning units, and retest to demonstrate compliance.

END OF SECTION 260519

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## SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. This Section includes basic materials and methods for grounding and bonding electrical systems and equipment. Grounding requirements specified in this Section may be supplemented in other sections of these Specifications.
  - 1. Grounding electrodes and conductors.
  - 2. Equipment grounding conductors.
  - 3. Bonding.
- B. System Requirements
  - 1. Electrical continuity to ground metal raceways and enclosures which are isolated from the equipment ground due to use of conduit or fittings which are nonmetallic (non-conducting), shall be established by providing by a green insulated grounding conductor of approved size within each raceway which shall connect to the isolated metallic raceways or enclosures at supply side. (If bare grounding conductors were specified, connect to enclosure on raceway at both ends.)
  - 2. Cold water or other utility piping systems alone not be used as grounding electrodes due to the use of insulating couplings and nonmetallic pipe in such installation. All grounding electrodes shall be "Made Electrodes" as specified herein.
  - 3. Non-current-carrying metal parts of all high voltage, conduit systems, supports, cabinets and enclosures shall be permanently and effectively grounded.
  - 4. Metallic or semi-conducting shields and lead sheaths of all cables operating at high voltage shall be permanently and effectively grounded at each splice and termination.
- C. Related Sections
  - 1. General electrical requirements: Section 260501.

## 1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.
- B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:
  - 1. American National Standards Institute.

- ANSI C2 National Electrical Safety Code.
- 2. American Society for Testing and Materials.
  - ASTM B3 Soft or Annealed Copper Wire.
  - ASTM 33 Standard Specification for Soft or Annealed Copper Wire for Electrical Purposes.
  - ASTM B8 Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- 3. Institute of Electrical and Electronics Engineers.
  - IEEE 81 Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
- 4. Lightning Protection Code (NFPA 78).
- 5. NEC National Electrical Code (NFPA 70).
- 6. NEMA National Electrical Manufacturers Association.
- 7. NFPA National Fire Protection Association
- 8. Underwriters Laboratories, Inc.
  - UL 467 Electrical Grounding and Bonding Equipment.
  - UL 486A Wire Connectors and Grounding Lugs for Use With Copper Conductors.
  - UL 96 Lightning Protection Components.

1.3 SUBMITTALS

- A. In addition to this Section, the submittal requirements of Section 260501, "General Electrical Requirements" are applicable.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Operating, Maintenance, and Instructional Data: Manufacturers' written operating, maintenance, and installation instructions, including directions for storage and protection, handling, examination, and preparation. Include specific instructions for preparation and installation of exothermic connectors.
  - 1. In addition, include copies of this data in Operating and Maintenance Manuals submitted, see Section 260501.

1.4 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards for grounding and bonding materials and systems. Provide products and

components listed and labeled by UL.

- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation."
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General- and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

#### 1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown prior to commencing the work.

#### 1.7 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of grounding electrodes.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

Subject to compliance with requirements, provide products by the following, or equal:

Anixter Brothers  
Blackburn  
Burndy  
A.B. Chance Co.  
Erico Products (CADWELD)  
Joslyn  
Kearney-National  
O-Z/Gedney  
Thomas & Betts

#### 2.2 GROUNDING AND BONDING PRODUCTS

- A. Products: Of types indicated and of sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications govern.
- B. Conductor Materials: Copper.

### 2.3 WIRE AND CABLE CONDUCTORS

- A. General: Comply with the following, except as otherwise indicated:
- B. Equipment Grounding Conductor: Green insulated copper.
- C. Grounding Electrode Conductor: Stranded copper cable.
- D. Bare Copper Conductors: Conform to the following:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Assembly of Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.

### 2.4 MISCELLANEOUS CONDUCTORS

- A. Ground Bus: Bare annealed copper bars of rectangular cross section, minimum 1/4 inch x 3 inch x 12 inch drilled and tapped every 2 inches on center for two hole lugs.
- B. Braided Bonding Jumpers: Copper tape, braided No. 30 gauge bare copper wire, terminated with copper ferrules.
- C. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2 inches wide, except as indicated.

### 2.5 CONNECTOR PRODUCTS

- A. General: Listed and labeled as grounding connectors for the materials used.
- B. Pressure Connectors: High-conductivity plated units.
- C. Bolted Clamps: Heavy-duty units listed for the application.
- D. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

### 2.6 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel with high-strength steel core and electrolytic-grade copper



outer sheath, molten-welded to core. Size: 3/4 inch in diameter by 10 feet in length.

- B. Plate Electrodes: Copper plates, minimum 0.10 inch thick, size as indicated.

## 2.7 TEST (GROUND) WELLS

- A. Precast concrete, 12" round x 18" deep open bottom valve box, with cast iron grate cover plate marked "GROUND."

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Equipment Grounding Conductor Application:

Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.

1. Install separate insulated equipment grounding conductors with circuit conductors for the following in addition to those locations where required by Code:

- a. Feeders and branch circuits.

- B. Underground conductors: Soft bare stranded copper, except as otherwise indicated.

1. Install minimum 4/0 AWG soft stranded copper buried ground loop cable as shown on drawings at least 3 feet below finished grade and minimum 3 feet from building.

- C. Signal and Communications System: Provide #4 AWG minimum green insulated copper conductor in raceway from the grounding electrode system to each terminal cabinet or central equipment location.

- D. Separately Derived Systems: Grounding shall be provided in accordance with the NEC, including Article 250.

- E. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to a grounding electrode as indicated in addition to separate equipment grounding conductor run with supply branch circuit.

- F. Service Entrance:

1. Grounding Conductor: Shall be sized in accordance with National Electrical Code to connect these items to the building bus in the service main equipment.
2. Equipment Bonding Jumper: Shall be sized in accordance with the National Electrical Code and be conducted on the supply side of the service main equipment.
3. Grounding Electrode: Bond together the following items to establish the electric service

grounding electrode, unless otherwise indicated:

- a. Minimum 20 feet number 3/0 AWG copper conductor encased in concrete footing or grade beam to contact with earth in two opposite directions.
- b. Building domestic water service entrance piping on house side of meter; provide bonding jumper across meter.
- c. Structural steel building framework.

G. Flexible metal and liquid-tight conduit: Provide equipment grounding conductors.

H. Rigid nonmetallic conduit: Provide equipment grounding conductors

### 3.2 INSTALLATIONS

General: Ground electrical systems and equipment in accordance with NEC requirements except where the drawings or specifications exceed NEC requirements.

- A. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare copper conductors buried at least 24 inches below grade. Connect bare copper cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Use 3/4 inch diameter by 10 foot long ground rods except as otherwise indicated. Drive rods until tops are 6 inches below finished floor or final grade except as otherwise indicated.
- B. Metallic Water Service Pipe: Provide insulated copper ground conductors, sized as indicated, in conduit from the building main service equipment, or the ground bus, to main metallic water service entrances to the building. Connect ground conductors to the main metallic water service pipes by means of ground clamps. Where a dielectric main water fitting is installed, connect the ground conductor to the street side of the fitting. Do not install a grounding jumper around dielectric fittings. Bond the ground conductor conduit to the conductor at each end.
- C. Ufer System (Concrete-Encased Electrode) Ground: Fabricate with a 20 feet of bare copper conductor laid lengthwise in excavation for foundation or footings. Install so conductor is within 2 inches of the bottom of the concrete. Where base of foundation is less than 20 feet in length, coil excess conductor at base of foundation. Bond conductor to reinforcing steel at four locations, minimum. Extend conductor below grade and connect to building grounding grid or ground electrode.
- D. Braided-Type Bonding Jumpers: Install to connect ground clamps on water meter piping to bypass water meters electrically. Use elsewhere for flexible bonding and grounding connections.
- E. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

- F. Test Wells: Locate as indicated, and fabricate in accordance with details indicated.
- G. Fences and Gates: See grounding details on the construction drawing for building and fence grounding requirements and details.
  - 1. Use flexible copper braid for bonding the gates of chain link fences.
- H. Cable Shields: Ground shields of any shielded power cable or signal cable at each splice or termination in accordance with recommendations of the splice or termination manufacturer.

### 3.3 CONNECTIONS

- A. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible. Make connections with clean bare metal at points of contact.
- B. Exothermic Welded Connections: Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Do not alter molds. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare copper grounding conductor to the ground bus in the housing. Bond electrically non-continuous conduits at both entrances and exits with grounding bushings and bare copper grounding conductors.
- D. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
- E. Connections at Test Wells: Use compression-type connectors on conductors and make bolted-and clamped-type connections between conductors and ground rods.
- F. Compression-Type Connections: Use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.
- G. Moisture Protection: Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

- H. Ground Bus Assembly: Make connections to the ground bus assembly in the following manner:
1. Bond cable to two hole lug using exothermic welding process.
  2. Bolt two hole lugs to ground bus assembly.

### 3.4 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

- A. Manholes and Handholes: Install a 3/4 inch diameter by 10 foot long driven ground rod close to the wall and set the rod depth such that 4 inches will extend above the finished floor. Where necessary, install ground rod before the manhole is placed and provide a #4/0 bare tinned-copper conductor from the ground rod into the manhole through a waterproof sleeve in the manhole wall. Protect ground rods passing through concrete floor with a double-wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below the concrete. Seal floor opening with waterproof nonshrink grout.
- B. Connections at Manholes: Connect exposed metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole to the ground rod or ground conductor. Make connections with a minimum #2 AWG stranded hard-drawn copper wire. Train conductors plumb or level around corners and fasten to manhole walls. Connect to cable armor and cable shields by means of tinned terminals soldered to the armor or shield, or as recommended by manufacturer of splicing and termination kits.
- C. Grounding System: Ground non-current-carrying metallic items associated with manholes, substations, and pad-mounted equipment by connecting them to bare underground copper cable and grounding electrodes arranged as indicated.

### 3.5 FIELD QUALITY CONTROL

- A. Test all ground fault interrupter (GFI) receptacles and circuit breakers for proper connection and operation with methods and instruments prescribed by the manufacturer.
- B. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the two-point method in accordance with Section 9.03 of IEEE 81.
- C. Ground/resistance maximum values shall be as follows:
1. Equipment rated 500 kVA and less: 10 Ohms.
  2. Equipment rated 500 kVA to 1000 kVA: 5 Ohms.
  3. Equipment rated over 1000 kVA: 3 Ohms.
  4. Unfenced substations and pad-mounted equipment: 5 Ohms.

5. Manhole and handhole grounds: 10 Ohms.
  6. Grounded secondary distribution system neutral and non-current carrying parts associated with distribution systems and grounds not otherwise covered: 25 ohms.
- D. Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are directed that exceed those indicated, the provisions of the Contract covering the changes shall apply.
- E. Report: Prepare test reports, certified by the testing organization, of the ground resistance and device function tests at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
1. Provide copies of reports of all grounding system tests for inclusion in Operation and Maintenance Manuals and for review by the Owner.

END OF SECTION 260526

## SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. This Section Includes:

1. Hangers, straps, clamps, steel channel, and fastening hardware for supporting and anchoring electrical work.

## B. Related Sections:

1. General electrical requirements: Section 260501.

## 1.2 REFERENCES

## A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.

## B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:

1. ANSI American National Standards Institute
2. ASTM American Society for Testing and Materials
3. IEEE Institute of Electrical and Electronics Engineers
4. NEC National Electrical Code (NFPA 70)
5. NEMA National Electrical Manufacturers Association
6. NFPA National Fire Protection Association
7. UL Underwriters Laboratories, Inc.
8. NECA National Electrical Contractors Association ("Standard of Installation")
9. SMACNA OSHPD Edition Sheet Metal Air Conditioning Contractors National Association

## 1.3 SUBMITTALS

## A. In addition to this Section, the submittal requirements of Section 260501, "General Electrical Requirements" are applicable.

## B. Product Data: Provide manufacturer's catalog data for supporting devices and fastening systems.

## C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instruction for

storage, handling, protection, examination, preparation, installation, and starting of Product.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70, "National Electrical Code."
- B. Furnish products listed and classified by Underwriter's Laboratories, Inc. as suitable for purpose specified and shown.

1.5 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation."
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.6 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

1.7 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown prior to commencing the work.
- B. Verify supporting device requirements prior to rough-in.
- C. Electrical work is shown on Drawings in approximate locations unless dimensioned. Provide supporting devices as required to complete the electrical work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by the following, or equal:

1. Hangers, Straps and Beam Clamps:

Appleton  
 Raco, Inc.  
 Steel City  
 O.Z./Gedney Co.  
 Midland Ross

2. U-Channel Systems, Slotted Metal Angle, and Fittings:

B-Line  
 Unistrut

3. Anchors:

Acherman-Johnson Corp.  
 B-Line  
 Hilti  
 Phillips Drill Co.  
 Rawl Products Co.

4. Conduit Sealing Bushings: O-Z/Gedney.

2.2 MATERIAL AND FABRICATION

A. Coatings: Supports, support hardware, and fasteners shall be protected with zinc coating. Products for use outdoors shall be hot-dip galvanized.

B. Manufactured supporting devices:

1. Raceway supports: Steel. Clevis hangers, riser clamps, pipe straps, threaded C-clamps with retainers, ceiling trapeze hangers, and wall brackets.

2. U-Channel systems: 12-gauge steel channels, with 9/16 inch diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture.

3. Fasteners: Types, materials, and construction features as follows:

- a. Expansion anchors: Carbon steel wedge or sleeve type.
- b. Toggle bolts: All-steel springhead type.
- c. Powder-driven threaded studs: Heat-treated steel, designed specifically for the intended service.

4. Concrete Inserts: Steel, with hot-dipped galvanized finish.

5. Cable support for vertical conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes required to suit



- individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
  - 6. Conduit sealing bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- C. Fabricated supporting devices:
- 1. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
  - 2. Steel brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
  - 3. Pipe sleeves: Provide pipe sleeves of the following:
    - a. Sheet metal: Fabricate from galvanized sheet metal: round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gauge metal for sleeve diameter noted:
 

3-inch and smaller:	20-gauge.
4-inch to 6-inch:	16-gauge.
Over 6-inch:	14-gauge.
    - b. Steel pipe: Fabricate from Schedule 40 galvanized steel pipe.
    - c. Plastic pipe: Fabricate from Schedule 80 PVC plastic pipe.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Provide supporting devices to fasten electrical components securely and permanently to the building or structure in accordance with NEC requirements. Install products in accordance with manufacturer’s instructions and also with notes and details provided on DSA approved plans for electrical equipment.
- B. Coordinate with the building structural, mechanical, and other systems, and with other electrical installation.
- C. Fastening: Fasten electrical items and their supporting hardware securely to the building structure. Electrical items include, but are not limited to: raceway, cables, cable tray, busway, transformers, panelboards, enclosed switches and motor controllers, control components, boxes, and cabinets.
  - 1. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock-resistant fasteners for attachments to concrete slabs.
  - 2. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams, or to a depth of more than 3/4 inch in concrete shall not cut reinforcing bars. Fill holes that are not used.

3. Fastening methods:
  - a. Wood: Wood screws.
  - b. Hollow masonry units: Toggle bolts.
  - c. Concrete or solid masonry: Concrete inserts or expansion bolts. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts.
  - d. Steel: Machine screws or welded steel studs.
  
- D. Conductors in vertical raceways: Provide support for wire and cable in riser pull boxes in accordance with NEC Article 300.
  
- E. Sleeves: Provide in concrete slabs and walls and all other fire-rated floors and walls for raceway and cable installations. For sleeves through fire-rated wall- or floor-construction, apply UL-listed firestopping sealant in gaps between sleeves and enclosed conduits and cables. Comply with the requirements of fire-resistant joint sealers in accordance the applicable Division 7 section.
  1. Conduit seals: Install conduit seals for conduit penetrations of slabs on grade and exterior walls below grade as indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

### 3.2 INSTALLATION, ADDITIONAL REQUIREMENTS FOR RACEWAYS

- A. General: Comply with the NEC and with the following requirements:
  1. Conform to manufacturer’s recommendations for selection and installation of supports.
  2. The strength of the support, including attachment to the building or structure, shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 pounds, provide additional strength until there is a minimum of 200 pounds safety allowance in the strength of each support.
    - a. Raceway shall be supported and braced per SMACNA OSHPD Edition “Guidelines for Seismic Restraint Systems and Plumbing Piping Systems.” (See Footnotes 12 and 13 of Table 23-P of Title 24 for limitations.)
  3. Install pipe straps, individual and multiple (trapeze-type) raceway hangers and riser clamps as necessary to support raceways. Provide U-channel and associated pipe channel straps, bolts, clamps, attachments, fasteners, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
    - a. Raceway run on surface of structure:
      - 1) For conduit run on building surface, use two-hole stamped steel pipe straps.
      - 2) For conduit runs on steel beams, use malleable iron pipe beam clamp bolted to beam.

- b. Raceway suspended from structure:
  - 1) Support parallel runs of horizontal raceways together on trapeze-type hangers.
  - 2) Support individual horizontal raceway by separate pipe hangers.
- 4. Support spacing: Maximum spacing shall be as allowed by the NEC.
  - a. Additional support required at unsupported boxes and access fittings: Support exposed and concealed raceway within 1 foot of an unsupported boxes and access fittings. In horizontal runs, this support may be omitted where box or access fitting is independently supported and raceway termination is not made with chase nipples or threadless box connectors.
  - b. Additional support required for vertical runs: Arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on the raceway terminals. Provide riser clamps for conduit at floor lines.

### 3.3 INSTALLATION, ADDITION REQUIREMENTS FOR EQUIPMENT AND ENCLOSURES

#### A. Component Anchorage Requirements:

- 1. All mechanical, plumbing, and electrical components shall be anchored and installed per the details on the DSA approved construction documents. Where no detail is indicated, the following components shall be anchored or braced to meet the force and displacement requirements prescribed in the 2016 CBC Sections 1616A.1.26 and ASCE 7-10 Chapter 13, 26 and 30:
  - a. All permanent equipment and components.
  - b. Temporary or movable equipment that is permanently attached (e.g. hard wired) to the building utility services such as electricity, gas or water.
  - c. Movable equipment which is stationed in one place for more than 8 hours and heavier than 400 pounds are required to be anchored with temporary attachments.
- 2. The attachments of the following mechanical and electrical components shall be positively attached to the structure but need not be detailed on the plans. These components shall have flexible connections provided between the component and associated ductwork, piping and conduit:
  - a. Components weighing less than 400 pounds and have a center of mass located 4 feet or less above the adjacent floor or roof level that directly support the component.
  - b. Components weighing less than 20 pounds, or in the case of distributed systems, less than 5 pounds per foot which are suspended from a roof or floor or hung from a wall.
- 3. For those elements that do not require details on the approved drawings, the installation shall be subject to the approval of the Structural Engineer of Record and the DSA

District Structural Engineer. The project inspector will verify that all components and equipment have been anchored in accordance with above requirements.

B. Piping, Ductwork, and Electrical Distribution System Bracing requirements:

1. Piping, ductwork, and electrical distribution systems shall be braced to comply with the forces and displacements prescribed in ASCE 7-10 Section 13.3 as defined in ASCE 7-10 Section 13.5.3, 13.6.7, 13.6.8 and 2017 CBC, Sections 1616A.1.23, 1616A.1.24, 1616A.1.25 and 1616A.1.26.
2. The method of showing bracing and attachments to the structure for the identified distribution system are as noted below. When bracing and attachments are based on a preapproved installation guide (e.g. OSHPD OPM), copies of the bracing system installation guide or manual shall be available on the jobsite prior to the start of and during the hanging and bracing of the distribution systems. The structural engineer of record shall verify the adequacy of the structure to support the hanger and brace loads.
3. Electrical distribution systems shall be detailed on the approved drawings with the project specific notes.

3.4 FIELD QUALITY CONTROL

A. Preparation for tests: Provide all jacks, jigs, fixtures, and calibrated indicating scales required for accurate, reliable testing. Obtain the Owner’s Representative and Structural Engineer’s approval before transmitting loads to the structure.

1. Test to 90 percent of rated proof load for fasteners. If fastener fails test, revise all similar fastener installations and re-test until satisfactory results are achieved.

B. Tests: Test pull-out resistance of one of each type, size, and anchorage material for the following fastener types:

1. Expansion anchors.
2. Powder-driven threaded studs.
3. Toggle bolts.

3.5 CLEANING

A. Clean surfaces to be painted.

END OF SECTION 260529

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## SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section includes provision of a mechanically- and electrically-complete conduit system including:
1. Rigid metal conduit.
  2. Intermediate metal conduit.
  3. Electrical metallic tubing.
  4. Rigid nonmetallic conduit.
  5. Flexible metal conduit.
  6. Liquidtight flexible conduit.
  7. Wireways (and auxiliary gutters).
  8. Surface raceway.
  9. Fittings and conduit bodies; accessories.
- B. Related Sections:
1. General electrical requirements: Section 260501.

## 1.2 REFERENCES

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.

In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:

- A. American National Standards Institute
- ANSI C80.1 Specification for Rigid Steel Conduit, Zinc-Coated.
  - ANSI C80.3 Specification for Electrical Metallic Tubing, Zinc-Coated.
  - ANSI C80.5 Rigid Aluminum Conduit.
  - ANSI/NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- B. American Society for Testing and Materials.
- ASTM 123 Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
- C. IEEE Institute of Electrical and Electronics Engineers.

- D. NEC National Electrical Code (NFPA 70).
- E. NECA National Electrical Contractors Association: "Standard of Installation."
- F. National Electrical Manufacturers Association
  - NEMA RN 1 PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
  - NEMA TC 2 Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
  - NEMA TC 3 PVC Fittings for Use with Rigid PVC Conduit and Tubing.
  - NEMA TC 6 PVC and ABS Plastic Utilities Duct for Underground Installation.
  - NEMA TC 9 Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.
- G. NFPA National Fire Protection Association
- H. Underwriters Laboratories, Inc.
  - UL 1 Flexible Metal Electrical Conduit
  - UL 6 Rigid Metal Electrical Conduit.
  - UL 94 Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.
  - UL 360 Liquidtight Flexible Steel Conduit, Electrical.
  - UL 514B Fittings for Conduit and Outlet Boxes.
  - UL 651 Rigid Nonmetallic Electrical Conduit.
  - UL 797 Electrical Metallic Tubing.
  - UL 1242 Intermediate Metal Conduit

1.3 SUBMITTALS

- A. General: Submit the following in accordance with the Conditions of the Contract and Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Product data: For all raceway products.
- C. Contractor shall be responsible for anchors and connections of electrical work to building structure to prevent damage as a result of earthquake, including the connection and integrity of field-fabricated materials and equipment. All building connections therefore shall be designed to resist seismic forces in conformance with Title 24 of the California Administrative Code.

Contractor shall submit shop drawings sealed by a Structural Engineer registered in the State of California to demonstrate compliance with the following requirement:

All raceway shall be supported and braced per SMACNA "Guidelines for Seismic Restraint Systems and Plumbing Piping Systems." (See Footnotes 12 and 13 of Table 23-P of Title 24 for limitations.)

- D. Samples: Provide samples upon specific request
- E. Installation instructions: Manufacturer's written installation instructions for [wireway], [surface raceway][, and] [nonmetallic raceway] products. Include instructions for storage, handling, protection, examination, and preparation of Product.

- F. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches.
- G. Substitutions: If materials are by manufacturers other than those specified, submit product data giving complete description for sizes employed, material types, and installation methods.
- H. Certificates:
  - 1. Labels of Underwriters' Laboratories, Inc. affixed to each item of material.
  - 2. If materials are by manufacturers other than those specified, submit certification what material meets applicable Underwriters' Laboratories, Inc. Standards.

1.4 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation".
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as



required to complete wiring system.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate with other Work:

1. Install conduits before concrete is placed, and in advance of masonry work.
2. Install conduits through roof in time to be flashed prior to roofing application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Subject to compliance with requirements, provide products by the following, or equal:

A. Conduit Bodies:

Adalet-PLM  
 Appleton Electric  
 Carlon  
 Crouse Hinds  
 Killark Manufacturing  
 OZ/Gedney  
 Spring City Electrical Mfg.

B. Wireway and Auxiliary Gutters:

Circle AW  
 Hoffman Engineering  
 Surface Metal Raceway:  
 Alrey-Thompson  
 B-Line  
 Isotrol  
 Square D  
 Wiremold

C. Surface Nonmetallic Raceway:

Carlon  
 Hubbell  
 Panduit  
 Wiremold

2.2 METAL CONDUIT AND TUBING

A. Rigid Metal Conduit: Steel, hot-dipped galvanized including the threads, with an outer coating of zinc bichromate, complete with one coupling and one end thread protector, manufactured in accordance with ANSI C80.1 and UL 6.

1. Threaded, hot-dipped galvanized fittings manufactured in accordance with ANSI C80.4.

2. Where indicated, provide galvanized rigid steel conduit and fittings with polyvinyl chloride (PVC) coating of nominal .020 inch (20 mil ) thickness conforming to NEMA Standard No. RN-1, Type A, Robroy Industries, or equal.
- B. Intermediate Metal Conduit: Hot-dipped galvanized steel including the threads, manufactured in accordance with UL 1242.
  - C. Electrical Metallic Tubing: Welded, electro-galvanized thin wall steel tubing, manufactured in accordance with ANSI C80.3 and UL 797.
    1. Maximum size shall be 2 inches.
    2. Provide compression type fittings in all areas.
      - a. Gland compression type, zinc plated steel body, cadmium plated malleable iron nut, O-Z/Gedney
      - b. Indenter type or set screw fitting are not acceptable.
  - D. Flexible metal Conduit: Hot-dipped galvanized steel interlocking, single-strip type manufactured in accordance with UL1.
    1. Squeeze type, malleable iron, cadmium plated, straight and angle connectors for all sizes and twist-in connectors for 1/2-inch and 3/4-inch flexible metal conduit.
    2. Integral copper ground wire on sizes 1-1/4" and smaller.
  - E. Liquidtight Flexible Conduit: Hot-dipped galvanized steel strip core with extruded liquid-tight polyvinyl jacket. Use O-Z/Gedney Type UAG, or equal.
    1. Liquid-tight fittings. ANSI/NEMA FB 1.
    2. Connectors: Cadmium plated malleable iron body and nut, cadmium plated steel ferrule, insulated throat, integral cast external ground lug, O-Z/Gedney.

### 2.3 NONMETALLIC CONDUIT AND DUCTS

- A. Rigid Nonmetallic Conduit: Polyvinyl chloride (PVC) heavy-wall conduit, with tapered sleeve couplings, rated and labeled for use with 90°C rated conductors, manufactured in accordance with ANSI C33.91.
  1. Cemented type fittings of the same manufacturer as the conduit.
  2. NEMA TC 2 and UL 651, Schedule 40.
- B. PVC Conduit and Tubing Fittings
  1. NEMA TC 3. Match to conduit or conduit/tubing type and material.
- C. Underground PVC and ABS Plastic Utilities Duct
  1. NEMA TC-6, Type I for encased burial in concrete, Type II for direct burial.
- D. PVC and ABS Plastic Utilities Duct Fittings

- 1. NEMA TC 9-1. Match to duct type and material.
- E. Liquidtight Flexible Nonmetallic Conduit and Fittings
  - 1. UL 1660. Fittings shall be specifically approved for use with this raceway.
- F. Conduit, Tubing, and Duct Accessories
  - 1. Types, sizes, and materials complying with manufacturer's published product information. Mate and match accessories with raceway.
- 2.4 CONDUIT BODIES
  - A. General
    - 1. Types, shapes, and sizes as required to suit individual applications and NEC requirements. Provide matching gasketed covers secured with corrosion-resistant screws.
  - B. Metallic Conduit and Tubing
    - 1. Use metallic conduit bodies. Use bodies with threaded hubs for threaded raceways.
- 2.5 WIREWAYS AND AUXILIARY GUTTERS
  - A. General: Electrical wireways shall be of types, sizes, and number of channels as indicated. Fittings and accessories including but not limited to couplings, offsets, elbows, expansion joints, adapters, hold-down straps, and end caps shall match and mate with wireway as required for complete system. Where features are not indicated, select for fulfill wiring requirements comply with applicable provisions of NEC.
  - B. Wireways covers shall be hinged type.
    - 1. Use sheet steel wireways with screw-on covers and corrosion resistant hardware. For dry locations coat with rust inhibitor and finish with gray baked enamel. For wet locations use hot-dipped galvanized material finished with gray baked enamel, provide gaskets for covers.
- 2.6 SURFACE RACEWAY
  - A. General
    - 1. Sizes and channels as indicated. Provide fittings that match and mate with raceway.
  - B. Surface Metal Raceway
    - 1. Construct of galvanized steel with snap-on covers, with 1/8-inch mounting screw knockouts in base approximately 8 inches o.c. Finish with manufacturer's standard prime coating suitable for painting. Provide raceways of types suitable for each application required. Provided by Hoffman Engineering Co., The Wiremold Co., or approved equal.

## C. Surface Nonmetallic Raceway

1. Two-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color. Raceway and system components shall meet UL 94 requirements for nonflammable, self-extinguishing characteristics. Provided by Hubbell, Inc., Panduit Corp., The Wiremold Co., or approved equal.

## 2.7 ACCESSORIES

- A. General: Reducers, bushings, washers, etc., shall be cadmium plated malleable iron of the shape and dimension best suited for the application.
- B. Seals for Walls and Floor Penetrations: Malleable iron body, oversize sleeve, sealing ring, pressure clamp and rings and sealing grommet, hex head cap screws, O-Z/Gedney Type FSK, or equal.
- C. Fire Seals: Heat activated intumescent material, elastomeric sealing ring, socket head cap screws, steel pressure discs and flange, O-Z/Gedney Type CFSF, Nelson Flame Seal, or equal.
- D. End bells: Hot-dipped galvanized, threaded malleable iron, O-Z/Gedney Type THS, or equal.
- E. Bushings:
  1. 1-1/4" and smaller: High-impact thermo-setting phenolic, 150°C, O-Z/Gedney Type "A", or equal.
  2. 1-1/2" and larger: Hot-dipped galvanized with thermosetting phenolic insulation, 150°C, O-Z/Gedney Type "B", or equal.
- F. Locknuts:
  1. 1-1/2" and smaller: Zinc plated heavy stock steel, O-Z/Gedney, or equal.
  2. 2" and larger: Cadmium plated malleable iron, O-Z/Gedney, or equal.
- G. Hubs: Cadmium plated malleable iron, tapered threads, neoprene "O" ring, insulated throat, O-Z/Gedney, or equal.
- H. Expansion Fittings: Hot-dipped galvanized malleable iron with bonding jumpers.
  1. Linear: O-Z/Gedney Type AX and TX, or equal.
  2. Linear, with deflection: O-Z/Gedney Type AXDX, or equal.
- I. Escutcheons: Chrome plated sectional floor and ceiling plates, Crane No. 10, or equal.

## PART 3 - EXECUTION

## 3.1 WIRING METHOD

- A. General: The wiring method shall be as follows, except as otherwise noted.
- B. Exterior:

1. Exposed: Rigid steel conduit.
2. Concealed: Rigid steel conduit.
  - a. In or under slab on grade: Nonmetallic conduit, Schedule 40 PVC. Conduit leaving the slab (including exposed conduit riser) shall be rigid steel conduit.
3. Underground, single run: Rigid nonmetallic conduit. Use Schedule 40 PVC. Provide concrete encasement as indicated.
4. Underground, grouped: Rigid nonmetallic conduit. Use Schedule 40 PVC. Provide concrete encasement as indicated.
5. Connection to vibrating equipment, including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment: Liquidtight flexible metal conduit, maximum length 18 inches.

C. Interior:

1. Exposed: Electrical metallic tubing.
  - a. Areas where exposed conduit may be subject to physical damage: Rigid metal conduit.
  - b. Damp or wet locations: Rigid metal conduit.
  - c. Classified locations: Rigid metal conduit.
2. Concealed: Electrical metallic tubing.
  - a. In or under slab on grade: Nonmetallic conduit, Schedule 40 PVC. Conduit leaving the slab (including exposed conduit riser) shall be rigid steel conduit.
  - b. In slab, above grade: Rigid nonmetallic conduit Schedule 40 PVC. Maximum size conduit in slab: 1 inch.
3. Connection to vibrating equipment, including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment: Flexible metal conduit, maximum length 18 inches.
  - a. For moist or humid locations or corrosive atmosphere, or where subject to water spray or dripping oil, grease, or water: Liquidtight flexible metal conduit.
4. Connection to lighting fixtures located in suspended acoustical or metal ceilings: Flexible metal conduit, maximum length 72 inches.
5. Final connections to lighting fixtures which have isolated junction boxes: Flexible metal conduit.
  - a. Damp locations: Liquidtight flexible conduit.

3.2 INSTALLATION

A. General Requirements:

1. Install electrical raceways in accordance with manufacturer's written installation

instructions, applicable requirements of NEC, and as follows.

- a. Minimum size: 3/4 inch unless otherwise indicated.
  - b. Size conduits as indicated on the drawings and as required by the NEC for the number and sizes of wires to be installed into the conduit.
  - c. Make conduit field cuts square with saw and ream out to full size. Shoulder conduits in couplings. Remove burrs, and swab inside conduits before conductors are pulled in.
  - d. Make all conduit joints mechanically tight, electrically continuous, and watertight. Pitch conduits in a manner to avoid creating moisture traps.
  - e. Install minimum 3/16" polypropylene pull cords from end-to-end in all empty raceways, tagged with the identification of service intended and location of opposite end. Leave at least 24 inches of pull cord at each end.
  - f. Restore wall, ceiling, and floor penetrations to the requirements of the Authority Having Jurisdiction.
  - g. Provide supports for raceways as specified in Section 260529, Supporting Devices.
    - 1) All raceway shall be supported and braced per SMACNA "Guidelines for Seismic Restraint Systems and Plumbing Piping Systems." (See Footnotes 12 and 13 of Table 23-P of Title 24 for limitations.)
  - h. Communications/Signal System Raceways 2-Inch Trade Size and Smaller: In addition to the above requirements, install raceways 2-inch and smaller trade size in maximum lengths at 150 feet and with a maximum of two, 90-degree bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.
  - i. Provide code sized green grounding conductor in all non-metallic conduit.
2. Perform excavating, trenching, backfillings, and compacting as shown, and as specified in the section in Division 2 which prescribes excavation, backfilling and compacting for utilities. Minimum cover for runs below finished grade outside buildings: 24 inches except where noted.
  3. Complete installation of electrical raceways before starting installation of conductors within raceways.
    - a. Protect inside of conduit from dirt and rubbish during construction by capping all openings with plastic caps intended for the purpose. Cap or plug conduits with standard manufactured accessories as soon as the conduits have been permanently installed in place.
  4. Install all conduits at elevations and locations to avoid interference with grading or other work, the structure, finished ceilings, walls. Avoid causing cutting of masonry structural members.
    - a. Do not place conduits in close proximity to equipment, systems, and service lines, such as hot water supply and return lines, which could be detrimental to the conduit and its contents. Maintain a minimum 3" separation, except in crossing, which shall be a minimum 1".
      - 1) Minimum separation from uninsulated hot water pipes, steam pipes, heater

- flues or vents: 6 inches. Avoid running conduit directly under water lines.
- 2) Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping.
5. Conceal conduit, unless indicated otherwise, within finished walls, ceilings, and floors. Keep raceways at least six (6) inches away from parallel runs of flues and steam or hot water pipes. Install raceway level and square and at proper elevations.
    - a. To prevent displacement, securely support and hold in place all conduits installed in advance of other work and to be concealed in the building structure. Carefully lay out conduits run within the structure, such as floors, beams, walls, to avoid densities excessive for the construction. Relocate those conduits when excessive densities occur.
    - b. Run conduits embedded in structural slabs in the middle of the slab below the top and above the bottom reinforcing steel. Minimum cover for conduit in concrete floors, walls or roof:  $\frac{1}{3}$  thickness of slab, but in no case less than 1-1/2" cover except where penetration is made. Do not install conduit larger than 1" in slabs. Tie raceways to reinforcing rods or otherwise secure them to prevent sagging or shifting during concrete placement. Space raceways laterally to prevent voids in the concrete. Where nonmetallic conduit is used, raceways must be converted to Schedule 80 or rigid steel conduit before rising above the floor.
    - c. Where conduit installed in concrete or masonry extends across building construction joints, provide expansion fittings as manufactured by O.Z.; Crouse-Hinds; Appleton; or equal, with approved ground straps and clamps. Expansion fittings installed in concrete shall be water tight - concrete tight deflection/expansion type.
    - d. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions except as otherwise indicated. This does not apply to conduits in crawl spaces.
  6. Install and neatly rack exposed conduits parallel with and perpendicular to building walls. Do not install exposed diagonal conduit runs.
    - a. Run exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run such as from wall to ceiling and that the raceways be of the same size. In other cases provide field bends for parallel raceways.
    - b. Use blockouts for concentrations of conduits in a confined area.
    - c. Route and suspend conduits crossing expansion joints to permit expansion, contraction, and deflection utilizing approved fittings to prevent damage to the building, conduits, and supporting devices.
    - d. Install exposed raceways parallel and perpendicular to nearby surfaces of structural members and follow the surface contours as much as practical.
    - e. Provide conduit bodies for exposed conduit runs at junctions, bends or offsets where required. Do not use elbows or bends around outside corners of beams, walls or equipment. Make conduit body covers accessible.
  7. Concrete Wall or Slab Penetrations: All core drilling, sleeves, blockouts or other

penetrations must be approved by the Structural Engineer prior to installation.

- a. Space sleeves and core drills to insure a minimum dimension of 3 times the nominal trade diameter of the largest adjacent conduit between sleeves or core drills.
  - b. Use blockouts for concentrations of conduits in a confined area.
8. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, use bonding jumpers to provide electrical continuity of the raceway system. Make raceway terminations tight. Where terminations are subject to vibration, use bonding bushings or wedges to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.
9. Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- a. Make no bends with a radius less than 12 times the diameter of the cable it contains nor more than 90 degrees. Make field bends with tools designed for conduit bending. Heating of metallic conduit to facilitate bending is not permitted.
  - b. Bends and offsets in 1" and smaller conduits may be done with approved bending devices. Do not install conduits which have had their walls crushed and deformed and their surface finish damaged due to bending.
  - c. Run conduits parallel to and at right angles to building lines.
  - d. Where space conditions prohibit the use of standard ells, elbows, and conduits, use cast ferrous alloy fittings of such forms and dimensions as best required for application.
10. Surface Raceway:
- a. Install a separate green ground conductor in raceway from the junction box supplying the raceway to receptacle of fixture ground terminals.
  - b. Select each surface raceway outlet box to which a lighting fixture is attached to be of sufficient diameter to provide a seat for the fixture canopy.
  - c. Where a surface raceway is used to supply a fluorescent lighting fixture having central stem suspension with a backplate and a canopy, with or without extension ring, the backplate and canopy will serve as the outlet box and no separate outlet box need be provided.
  - d. Provide surface raceway outlet box, in addition to the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end stem suspension.
  - e. Where a surface raceway extension is made from an existing outlet box on which a lighting fixture is installed, provide a backplate slightly smaller than the fixture canopy, and no additional surface mounted outlet box need be installed.
  - f. Surface raceways shall be securely fastened to the mounting surface. Use expansion type anchors in concrete.
11. Do not run conduits exposed on the roof unless approval is obtained from the Owner prior to installation.

B. Other Requirements:



1. Connect motors, equipment containing motors, equipment mounted on an isolated foundation, transformers, and other equipment and devices which are subject to vibration and which require adjustment with flexible metallic conduit from the device to the conduit serving it. Size the flexible conduit length more than 12 diameters, but less than 18 diameters. Rigidly support the points of attachment on each side of the connection. Use external bonding jumpers on sizes 1-1/2" and above.
2. Install escutcheons on all exposed conduits passing through interior floors, walls, or ceilings. Install fire seals on all conduits passing through fire rated partitions. Install wall and floor fire seals on all conduits passing through exterior walls and floors, or use standard galvanized steel pipe sleeves; diameters 1/2" greater than the outside diameter of the sleeved conduit and fill the annular space with mastic or caulk with lead.
3. Fire pump room: All wiring shall be installed in rigid metal, liquid-tight flexible metal conduit.
4. Raceway for panelboards:
  - a. All homeruns shown shall be run to the panel indicated independently of all other homeruns. Provide pull points so as not to exceed total bends of 270 degrees.
  - b. Run a minimum of one 3/4-inch empty conduit for every three single pole spare circuit breakers, spaces or fraction thereof and not less than two 3/4-inch conduits from every flush mounted panel to an accessible space above the ceiling and below the floor.
5. Make conduit projections from covered areas to areas exposed to the weather watertight by proper flashing. Extend flashing a minimum of 6 inches in all directions from conduit.
6. Cap conduits indicated to be stubbed-out underground using glued on PVC caps intended for this purpose.
7. Install a coupling flush with the floor on all conduits stubbed-up through the floor slab.
8. Do not penetrate walls with flexible conduit where subject to physical damage. Use recessed box with extension ring for transition from interior to exterior of wall.
9. Terminations:
  - a. Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.
  - b. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
  - c. At switchboards, manholes and floor standing distribution panelboards, provide insulated throat bushings or bell ends on all non-metallic conduit entries and bushings on all metallic conduit entries.
  - d. Install insulated throat threaded hubs on conduits entering enclosures without threaded hubs.
  - e. Install end bells on conduits stubbed through slabs and foundations into electrical enclosures.
10. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with

UL- listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

- a. Where conduits enter or leave hazardous locations.
  - b. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
  - c. Where required by the NEC.
11. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used six (6) inches above the floor. Where equipment connections are not made under this contract, install screwdriver-operated threaded flush flush with floor.
- a. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so that curved portion of bends is not visible above the finished slab.
12. Flexible Connections: Use short length (maximum of 6 feet) of flexible conduit for recessed and semi-recessed lighting fixtures, for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet locations. Install separate ground conductor across flexible connections.
13. PVC Coated Rigid Steel Conduit:
- a. Do not store conduit in direct sunlight.
  - b. Use pipe straps, no pipe wrenches or channel wrenches, when tightening connections to avoid damaging PVC coating.
  - c. Patch all gouges or cuts in the PVC coating after installing conduit. Use manufacturer's recommended patching paste. Build up area to be patched to full mil thickness of coating and feather out paste on sides of damaged area a minimum of 1/2-inch to provide a completely bonded seal.
  - d. Field bend conduit with shoes for a mechanical bender sized for the next larger size conduit.
  - e. Bends used in or below concrete slabs shall be, rigid steel type elbows, use for all stub-ups with flush floor coupling at transitions.
14. Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings except as otherwise indicated.

### 3.3 FIELD QUALITY CONTROL

- A. Examine surfaces to which conduits are to be secured for:
  1. Defects which will adversely affect the execution and quality of work.
  2. Deviations from allowable tolerances for the building material.
- B. Do not start work until defects and deviations are corrected.

3.4 CLEANING

- A. Upon completion of installations of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.

3.5 PROTECTION OF FINISHED WORK

- A. Protect inside of conduit from dirt and rubbish during construction by capping all openings with plastic caps intended for the purpose.
- B. Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

END OF SECTION 260533

## SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

## 1.1 SUMMARY

## A. Section includes:

1. Ducts.
2. Ductbanks.
3. Manholes, handholes, and precast concrete pullboxes.

## B. Related Sections: The following sections contain requirements that relate to this Section:

1. Division 31 Section "Earthwork," for general requirements for excavation, backfill, and related items for ducts, manholes, handholes, and precast concrete pullboxes.
2. General electrical requirements: Section 260501.

## 1.2 REFERENCES

## A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.

## B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:

1. American Association of State Highway and Transportation Officials  
AASHTO H 20
2. American National Standards Institute.  
ANSI C2 National Electrical Safety Code.  
ANSI C80.1 Specification for Rigid Steel Conduit, Zinc-Coated.  
ANSI/NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
3. American Society for Testing and Materials.  
ASTM C 478 Specification for Precast Reinforced Concrete Manhole Sections.  
ASTM C 891 Practice for Installation of Underground Precast Concrete Utility Structures.  
ASTM 123 Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
4. Federal Specification [from General Services Administration]  
FS RR-F-621 Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole.
5. IEEE Institute of Electrical and Electronics Engineers.
6. NEC National Electrical Code (NFPA 70).
7. National Electrical Manufacturers Association.  
NEMA RN 1 PVC Externally-Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.

NEMA TC 6 PVC and ABS Plastic Utilities Duct for Underground Installation.  
 NEMA TC 8 Extra-Strength PVC Plastic Utilities Duct for Underground Installation.  
 NEMA TC 9 Fittings for ABS and PVC Plastic Utilities Duct for Underground Installation.

- 8. NFPA National Fire Protection Association
- 9. Underwriters Laboratories, Inc.  
 UL 651 Schedule 40 and 80 PVC Conduit.

1.3 SUBMITTALS

- A. In addition to this Section, the submittal requirements of Section 260501, "General Electrical Requirements" are applicable.
- B. Shop Drawings: Indicate dimensions, reinforcement, size and locations of openings, and accessory locations for precast manholes, handholes, and pullboxes.
- C. Product Data: Provide for conduit and duct, and manhole, handhole, and pullbox accessories.
- D. Manufacturer's Instructions: Include instructions for storage, handling, protections, examination, preparation, and installation.

1.4 DEFINITIONS

Duct: The general term for electrical conduit and other raceway, either metallic or nonmetallic, specified for use underground, embedded in earth or concrete.

Duct Bank: A group of two or more ducts in a continuous run between two points.

Handhole: A below-the-surface enclosure in connection with ducts into which people reach, but do not enter, for the purpose of installing, operating, or maintaining equipment or wiring.

Manhole: A below-the-surface enclosure or chamber, large enough for a person to enter, connecting with ducts, and affording facilities for installing, operating, and maintaining equipment or wiring.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of exact routing of ductbank.
- B. Accurately record actual locations of each pullbox, handhole and manhole.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with a minimum of three years documented experience.

1.7 QUALITY ASSURANCE

- A. Electrical component standard: Components and installation shall comply with NFPA 70, "National Electrical Code."

- B. NEMA compliance: Comply with applicable requirements of NEMA standards pertaining to conduits and ducts.
- C. UL compliance and labeling: Comply with applicable requirements of UL standards pertaining to electrical ductbank systems. Provide ductbank products and components listed and labeled by UL, ETL, or CSA.
- D. Test Mandrel:
  - 1. Swab and pull mandrel, 1/4" smaller in diameter than the conduit, through the entire length.
  - 2. If any obstructions are encountered, locate and replace the obstructed area. Then retest the duct bank system.

1.8 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

1.9 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of duct bank prior to excavation for rough-in.
- C. Verify locations of pullboxes, handholes, and manholes prior to excavating for installation.
- D. Duct bank routing is shown on Drawings in approximate locations unless dimensions are indicated. Route as required to complete duct system.
- E. Pullbox, handhole, and manhole locations are shown on Drawings in approximate locations unless dimensions are indicated. Route as required to complete duct system.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:

Subject to compliance with requirements, provide products by the following, or equal:

1. Metal Conduit and Fittings: Triangle, Pittsburgh, Robroy, Spang, Steel City, NEPCO.
  2. Nonmetallic Conduit and Fittings: Carlon, or equal.
- B. Rigid Nonmetallic Conduit: Polyvinyl chloride (PVC) heavy-wall conduit, with tapered sleeve couplings, rated and labeled for use with 90°C rated conductors, manufactured in accordance with ANSI C33.91.
1. Cemented type fittings of the same manufacturer as the conduit.
  2. NEMA TC 2 and UL 651, Schedule 40.
- C. Rigid Metal Conduit: Hot-dipped galvanized steel including the threads, with an outer coating of zinc bichromate, complete with one coupling and one end thread protector, manufactured in accordance with ANSI C80.1 and UL 6.
1. Threaded, hot-dipped galvanized fittings manufactured in accordance with ANSI C80.4.
  2. Where indicated, provide galvanized rigid steel conduit and fittings with polyvinyl chloride (PVC) coating of nominal .020 inch (20 mil ) thickness conforming to NEMA Standard No. RN-1, Type A.
- D. Underground PVC and ABS Plastic Utilities Duct
1. NEMA TC-6, Type I for encased burial in concrete, Type II for direct burial.
- E. PVC and ABS Plastic Utilities Duct Fittings
1. NEMA TC 9-1. Match to duct type and material.
- F. Duct Accessories
1. Types, sizes, and materials complying with manufacturer's published product information. Mate and match accessories with raceway.
- G. Precast Concrete Pullboxes
1. Concrete pullboxes shall be Parkway or Traffic type, as required by location use. Precast in sections with cover marked "Electric" or "Telephone" and with brass hexhead screws. Traffic type shall be constructed for H-20 loading. Acceptable manufacturers: Brooks, Jensen or Quickset.
- H. Precast Concrete Manholes
1. Pre-cast, rectangular, with opening complete with cover. Sizes as indicated on the drawings and, in no case, of less size or material thickness than required by the governing code or utility company requirements. Provide with complete necessary hardware. All ferrous material shall be hot dip galvanized after fabrication. Care shall be exercised in locating boxes to avoid installation in drain water flow areas, and disruption of existing utilities.
  2. Provide precast steel reinforced concrete box complete with all accessories, cable racks and supports, extension rings, pumps, drains, facilities, etc., sized as indicated on

drawings. Each section shall have suitable knockouts or openings in vertical walls for all duct banks and conduits entering the assembled structure.

3. Each casting shall be identified by having the manufacturers' name and address cast into an interior face or permanently attached thereto. The complete assembly, including frame and cover, shall be rated for AASHTO H-20 Bridge Loading. Submit manufacturer's certificate showing compliance with structural requirements.
  - a. All covers shall be rated for supporting motor vehicle traffic.
  - b. Provide all covers with appropriate utility system description cast in the cover or by bead weld. Unless otherwise indicated, the inscription shall indicate:

Power: "ELECTRIC"

Communications or Signal: "COMMUNICATIONS" or "SIGNAL"

4. Frames, covers and gratings shall be made of cast iron or galvanized steel. Steel frames and covers of steel shall be welded by qualified welders in accordance with standard commercial practice. Steel grating shall be of welded galvanized construction and conform to requirements of RR-G-661, Type 1. Provide concrete ring(s) to bring top cover to required elevation. Concrete ring(s) shall be of sufficient height to provide 24" minimum earth cover over the top of box roof, unless otherwise indicated.
5. Pulling irons shall be steel bars bent in a "U" shape, and cast in the walls and floors. In the floor, they shall be centered, and in the wall they shall not be less than 6 inches above or below, and opposite the knockout panels for conduit. Pulling irons shall project into the box approximately 4 inches. Irons shall be hot dip galvanized.
6. Vertical cable racks, including hooks and porcelain insulator cable cradles, shall be sufficient to accommodate the cables.
  - a. The wall bracket shall be channel or T-section steel.
  - b. The hooks shall be of steel or malleable iron and shall be of the removable type.
  - c. The vertical portion of racks shall be hot-dip galvanized steel after fabrication.
  - d. Vertical racks shall be installed on all walls of the manhole a minimum of 18" on center x 60" high. A rack shall be installed within 12" of each corner of each wall. Additional racks spaced equally on each wall shall be installed.
  - e. Wall racks shall be slotted to accept removable hooks and lock hooks into place.
  - f. All fastening hardware, bolts, washers and nuts shall be hot dip galvanized steel.
  - g. Provide 5/8 in. diameter anchor bolts and concrete inserts to support each cable rack.
  - h. Use Underground Devices Inc. No. CR36, RA08, SB10N cable rack, or equal, hot dipped galvanized, for each box.
  - i. Use Underground Devices Inc. No. CR36, RA08, SB10N cable hook, or equal, hot dipped galvanized, to mount on each cable rack.
  - j. Use T & B tie rap, self-locking, cable ties No. RV528MX or equal, 2 per insulator, to secure cable to cable hook and cable insulator.
7. Cable Duct Shields: Shields shall be provided where cables enter and leave box, and other duct entrances, and shall be suitable type manufactured for the purpose. All conduits shall have endbells.
8. Provide 8" - 12" diameter sump in the bottom of the box with 18" deep clay tile pipe sump, with cast iron grate.
9. Provide water tight sealing compound between each joint in the sections of the box.



10. The minimum box necking height shall be not less than 24" high with a minimum of two (2) 6-inch high removable necking rings. Provide two galvanized step rungs and ladder rung retainers.
11. Exterior walls and tops of structure shall be damp-proofed on the exterior face with two coats of bituminous damp-proofing.
12. Provide ground rods in box.
13. Interior wall shall be painted white in color with concrete paint.
14. Acceptable manufacturers:
  - a. Brooks Products
  - b. Associated Concrete Products (Quickset)
  - c. Jensen
  - d. Or Equal.

I. Precast Concrete Handholes

1. Same requirements as precast concrete manholes.
  - a. Size as shown.

J. Cable Tags

1. Shall be 2" diameter, black anodized aluminum with 3/16" diameter hole. Lettering shall be 5/32" machine engraved and coated with clear lacquer. Include the following information:
  - a. Feeder designation and size.
  - b. Phase designation, tag "A," "B," or "C" as required.
  - c. Manufacturer's name.
  - d. System voltage.
  - e. Date cable first energized.

PART 3 - EXECUTION

3.1 WIRING METHOD

A. Wiring Method shall be as follows:

1. Exposed: Rigid steel conduit, unless otherwise indicated.
2. Concealed: Rigid steel conduit, unless otherwise indicated.
  - a. In or under slab on grade: Nonmetallic conduit, Schedule 40 PVC unless otherwise indicated. Conduit leaving the slab (including exposed conduit riser) shall be rigid steel conduit.
3. Underground, single run: Rigid nonmetallic conduit. Use Schedule 40 PVC unless otherwise indicated. Provide concrete encasement as indicated. Conduit leaving the slab (including exposed conduit riser) shall be rigid steel conduit.
4. Underground, grouped: Rigid nonmetallic conduit. Use Schedule 40 PVC unless otherwise indicated. Provide concrete encasement as indicated. Conduit leaving the slab

(including exposed conduit riser) shall be rigid steel conduit.

### 3.2 INSTALLATION

#### A. Exercise care in excavating, trenching and working near existing utilities.

##### Trenching and Backfill:

1. Contractor shall trench underground duct path and manhole location with utmost care in order to avoid existing underground facilities. Trench size shall be kept to a minimum. No oversized trench shall be made unnecessarily.
2. All trench excavations by the Contractor shall be backfilled by same in accordance with this specification.
3. All material excavated during underground electrical work is not pre-qualified for backfill.
4. All fill must be placed in layers not exceeding 8 inches in depth and hand tamped or machine compacted to at least 95 percent of its maximum dry density as computed by the ASTM method of performing a compaction test (D-1557-70).
5. All compacted fill will be under continuous inspection by the Inspector. Compaction tests will be arranged for by the Inspector in cooperation with the Contractor.
6. Puddling or water-flooding for settling backfill will not be permitted except in landscaped areas. The addition of water shall be limited to achieving optimum moisture content for tamp procedures.
7. Where Contractor trenches crosses any finished road (paved or gravel), he shall be responsible for restoring the road to its original condition. Repaving shall be with the same surrounding material and to a quality equal or exceeding its surround.
8. Do not backfill for a period of at least 24 hours after pouring concrete. Upon receipt of the Inspector's approval proceed with backfill. Backfill with 1 sack slump concrete and repair of surface to be completed within 24 hours of approval. Provide wet sand backfill in landscape areas.
9. Survey slope of trenches and ducts between terminations to provide drainage. No pockets shall be permitted.

#### B. Underground Duct with Concrete Encasement:

1. Underground ductbanks lines shall be constructed of individual conduits encased in concrete. Conduit shall be of Schedule 40 PVC. The kind of conduit used shall not be mixed in any one duct bank. PVC ducts shall not be smaller than 2 inches in diameter unless otherwise indicated. The concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least 3 inches of concrete outer encasement for ducts. Conduit shall be separated by a minimum concrete thickness of 2 inches.
2. The top of the concrete envelope shall not be less than 36 inches below grade, except that under roads and pavement it shall be not less than 36 inches below grade.
3. Ductbanks shall have a continuous slope downward toward manholes with a pitch of not less than 1.5 inches in 100 feet. Except at conduit risers, changes in direction of runs exceeding a total of 10 degrees, either vertically or horizontally, shall be accomplished by long sweep bends having a minimum radius of curvature of 25 feet. Sweep bends may be made of one or more curved or straight sections or combinations thereof. Manufactured bends shall have a minimum radius of 24 inches for use with conduits of less than 3

- inches in diameter and a minimum radius of 48 inches for ducts of 3 inches in diameter and larger.
4. PVC conduits shall terminate in end-bells where duct lines enter pullboxes or manholes. Separators shall be of precast concrete, high-impact polystyrene, steel, or any combination of these. The joints of the conduits shall be staggered by rows and layers so as to provide a duct line having maximum strength.
  5. During construction, partially completed duct lines shall be protected from the entrance of debris such as mud, sand, concrete and dirt by means of suitable conduit. As each section of a duct line is completed, a testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the size of the conduit shall be drawn through each conduit, after which a brush having the diameter of the duct and having stiff bristles shall be drawn through the conduit until it is clear of all particles of earth, sand, or gravel. Conduit plugs shall then be immediately installed.
  6. Locate spacers no greater than 5 ft. center to center, along entire length of ductbank.
  7. Duct couplings may be placed side by side horizontally, but staggered at least 6 in. vertically.
  8. Make conduit joints in accordance with manufacturer's recommendations. In the absence of specific recommendations, make the joints as follows:
    - a. Brush a plastic solvent cement on the inside of the coupling and on the outside of the duct ends.
    - b. Slip duct and fitting together with a quick one-quarter turn to set the joints.
  9. Follow ductbank sections on the drawings for size, arrangement and spacing of ducts.
  10. Secure ducts and spacers to prevent movement during placement of concrete.
  11. At connection to existing manhole, dowel the concrete encasement with one #4 reinforcing bar 36 in. long per duct. (Minimum of two required.)
  12. Concrete; in accordance with the following:
    - a. Provide #4 rebar dowels at each concrete joint/pour transition. A minimum of 8' long #4 rebar dowel, one (1) per conduit in ductbank.
    - b. Provide rebar and tie-downs to prevent conduits from floating to top of concrete during curing.
    - c. Make ductbank construction monolithic top to bottom and side to side.
    - d. Do not exceed the outside dimension of the completed ductbank by more than 1 inch in the vertical or 4 inches in the horizontal from dimensions indicated.
    - e. Use plastic film to retain moisture for proper curing.
  13. Ductbank concrete may be poured without forming, provided trench walls are firm and will not cave in during installation. Unless noted otherwise, encase the raceway on all sides with a minimum of 3 inches of concrete.
  14. Where conduits are stubbed out for future connection, stop concrete 12 inches from end of conduit. Provide a waterproof cap on the end of the conduit.
  15. The top of the concrete ductbank shall be as shown on the drawings, or as otherwise required by code and as required to coordinate with other underground obstructions.

#### C. Connections to Existing Ducts

1. Where connections to existing duct lines are indicated, excavate the lines to the maximum depth necessary. Cut off the lines and remove loose concrete from the conduits

before installing new concrete encased ducts. Provide a reinforced concrete collar, poured monolithically with the new duct line, to take the shear at the joint of the duct lines. Remove existing cables which constitute interference with the work.

D. Connections to New Handholes and Manholes

1. Construct concrete-encased duct lines connecting to underground structures to have a flared section adjacent to the handhole or manhole to provide shear strength. Construct underground structures to provide for keying the concrete encasement of the duct line into the wall of the structure. Use vibrators when this portion of the encasement is poured to ensure a seal between the encasement and the wall of the structure.

E. Connection to Existing Handholes and Manholes

1. For duct line connections to existing structures, break the structure wall out to the dimensions required and preserve steel in the structure wall. Cut steel and band out to tie into the reinforcing of the duct line encasement. Chip out the structure wall to form a key for the duct line encasement.

F. Connections to Existing Concrete Pads

1. For duct line connections to concrete pads break an opening in the pad out to the dimensions required and preserve steel in pad. Cut the steel and bend out to tie into the reinforcing of the duct line encasement. Chip out the opening in the pad to form a key for the duct line encasement.

G. Removal of Ducts

1. Where duct lines are removed from existing manholes, close openings and waterproof manhole. Chip out the wall opening to provide a key for the new section of wall.

H. Precast manholes, handholes, and pullboxes shall be of sizes required.

1. Manholes and handholes:
  - a. Precast concrete assembly shall be set on 6 inches of level, 95 percent compacted, crushed rock fill, 3/4" to 1" size, extending 12" beyond the manhole on each side. Granular fill shall be compacted by a minimum of four passes with a plate type vibrator. Drain line and accessories shall be installed as indicated.
  - b. Excavate, backfill, and compact in accordance with Section 022XX. Utilize dirt removed to level and restore landscape a minimum of 6 feet around box.
  - c. Seal section joints with sealing compound furnished by the manufacturer.
  - d. Apply two coats of asphalt paint to cover frames.
  - e. Provide two 3/4" diameter x 10" long copper-clad driven ground rods at opposite corners of manholes and handholes with #2/0 AWG bare copper ground wire interconnecting all non-current carrying metal components in manhole or handhole with compression type ground fittings at each connection point.
  - f. Ground all cable racks, supports, metal conduits and ductbank grounding conductors to the driven grounding electrode.
  - g. Restore landscape to original condition.

- h. Place duct and conduit entries not less than 24" above floor. Provide end bells at all duct entrances. Terminate each metal conduit with insulated bushing having grounding terminal.
- i. Place pulling irons on opposite walls and below horizontal centerlines of duct openings, and in bottom directly below cover. Install pulling irons with each end hooked around a reinforcing bar.
- j. Dampproof exterior walls and tops of structure below grade with two coats of bituminous coating. Use A.C. Horn Company "Dehydratine" No. 4, Sonneborn Sons, Inc. "Hydrocide 648," Toch Brothers "RIW Marine Cement Semi-Mastic," or equal.
- k. Identify all power and signal cables by tagging in all man holes. Tie securely to cables with nylon cord.
- l. Install cables in conformance with NEC requirements.

END OF SECTION 260543

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes:
  - 1. Equipment labels and signs.
  - 2. Identification labeling for raceways, cables, and conductors.
  - 3. Buried electrical line warnings.
  - 4. Warning and caution signs
  - 5. Operational instruction signs.
  
- B. Electrical identification requirements in this Section may be supplemented in other sections of these specifications.
  
- C. Related Sections:
  - 1. General electrical requirements: Section 260501.
  - 2. Color coding of conductors for phase identification: Section 2605019.
  - 3. Refer to other Division 26 sections for additional specific electrical identification associated with specific items.

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.
  
- B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:
  - 1. ANSI American National Standards Institute.
  - 2. ASTM American Society for Testing and Materials.
  - 3. IEEE Institute of Electrical and Electronics Engineers.
  - 4. NEC National Electrical Code (NFPA 70).
  - 5. NEMA National Electrical Manufacturers Association.
  - 6. NFPA National Fire Protection Association
  - 7. UL Underwriters Laboratories, Inc.

1.3 SUBMITTALS

- A. In addition to this Section, the submittal requirements of Section 260501, "General Electrical Requirements" are applicable.

- B. Product Data: Provide catalog data for nameplates, labels, and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.4 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual labeling and identification of electrical equipment, components, and wiring.

1.6 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation."
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.7 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General- and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

1.8 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown prior to commencing the work.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

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

1. Brady
2. Ideal Industries
3. Markal
4. Panduit
5. Thomas & Betts

### 2.2 ELECTRICAL IDENTIFICATION PRODUCTS

A. Adhesive Marking Labels for Raceway and Metal-clad Cable: Pre- printed, flexible, self-adhesive labels with legend indicating voltage and service (Emergency, Power, Lighting, Air Conditioning, Voice and Data Communications, Control, Fire Alarm and Detection, Public Address (Paging), Electronic Security).

B. Label Size, as follows:

1. Raceways 1-Inch and Smaller: 1-1/8 inches high by 4 inches long.
2. Raceways Larger than 1-Inch: 1-1/8 inches high by 8 inches long.

C. Color: Black legend on orange background.

D. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.

E. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Raceway and Cable Identification: Flexible acrylic bands sized to suit the raceway diameter and arranged to stay in place by pre- tensioned gripping action when coiled around the raceway or cable.

F. Underground Line Marking Tape: Permanent, bright-colored, continuous-printed, plastic tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.

G. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self- adhesive, wraparound, cable/conductor markers with Preprinted numbers and letter.

H. Aluminum, Wraparound, Cable Marker Bands: Bands cut from 0.014- inch thick, aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or numbers.

I. Plasticized Card Stock Tags: Vinyl cloth with preprinted and field-printed legends to suit the application. Orange background, except as otherwise indicated, with eyelet for fastener.



- J. Aluminum-Faced Card Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inches thick, and laminated with moisture-resistant acrylic adhesive. Pre-print legend to suit the application, and punch for tie fastener.
- K. Brass or Aluminum Tags: Metal tags with tamped legend, punched for fastener. Dimensions: 2 inches by 2 inches by 19 gauge.
- L. Engraved, plastic-laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes. Engraved legend in white letter on black face and punched for mechanical fasteners.
- M. Warning and caution signs for indoor use: Shall be minimum 18 gauge steel, white porcelain enamel finish, with red lettering, punched for fasteners, with colors, legend, and size appropriate to the location. Lettering to read, "DANGER - HIGH VOLTAGE - KEEP OUT," unless otherwise indicated.
- N. Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, nonfading, preprinted cellulose acetate butyrate signs with 20-gauge, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 1/4-inch grommets in corners for mounting.
- O. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.
- P. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50 deg F to 350 deg F. Provide ties in specified colors when used for color coding.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General:
  - 1. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.
  - 2. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.
  - 3. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- B. Identify electrical equipment and enclosures, including but not limited to the following:
  - 1. General

- a. Switchgear and switchboards
  - b. Panelboards
  - c. Enclosed switches
  - d. Transfer switches
  - e. Enclosed motor controllers
  - f. Control devices, such as pushbutton- or rotary-selection stations
  - g. Motor control centers
  - h. Substations and transformers
  - i. Contactors
  - j. Lighting system relay cabinets
  - k. Dimming controls
  - l. Power supplies, inverters, and rectifiers
  - m. Pull-, junction-, and splice-boxes
  - n. Terminal boxes and cabinets
  - o. Access doors and panels for concealed electrical items
- C. Identify underground electrical lines:
- D. Identify electrical circuits:
- E. Identify conduit containing circuit wiring operating at over 600 volts:
- 1. State "DANGER - HIGH VOLTAGE" in black letters 2-inches high, stenciled at 10-foot intervals over a continuous-painted orange background.
  - 2. In addition, the following areas shall be identified:
    - a. The entire floor area directly above conduits running beneath and within 12 inches of a basement or ground floor that is in contact with earth or is framed above an unexcavated space.
    - b. On wall surfaces directly external to conduits run concealed within wall.
    - c. On all accessible surfaces of concrete envelope around conduits in vertical shafts, exposed at ceilings, or concealed above suspended ceilings.
    - d. On entire surface of exposed conduits.
- F. Identify Junction, Pull, and Connection Boxes: Code-required caution sign for boxes shall be pressure-sensitive, self-adhesive label indicating system voltage in black, preprinted on orange background. Install on outside of box cover. Also label box covers with identity of contained circuit. Use pressure-sensitive plastic labels at exposed location and similar labels or plasticized card stock tags at concealed boxes.
- G. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground plastic line marker, located directly above line at 6 to 8 inches below finished grade. Where multiple line installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.
- H. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductor throughout the project secondary electrical system as follows:

<u>208/120 Volts</u>	<u>Phase</u>	<u>480/277 Volts</u>
Black	A	Yellow
Red	B	Brown
Blue	C	Orange
White	Neutral	Gray
Green	Ground	Green

- I. Use conductors with color factory-applied the entire length of the conductors except as follow:
  - 1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
    - a. Apply colored, pressure-sensitive plastic tape in half- lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two lap of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
    - b. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and paced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.
  
- J. Power Circuit Identification: Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuit in vault, pull boxes, junction boxes, manhole, and switchboard rooms with 1/4-inch steel letter and number tamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-lb test monofilament line or one-piece self-locking nylon cable ties.
  
- K. Tag or label conductors as follows:
  - 1. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuit numbers.
  - 2. Multiple Circuits: Where multiple branch circuits or control wiring or communications / signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home run) label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by means of coded color of conductor insulation. For control and communication / signal wiring, use color coding or wire / cable marking tape at termination and at intermediate location where conductors appear in wiring boxes, troughs, and control cabinet. Use consistent letter / number conductor designation throughout on wire / cable marking tape.
  - 3. Match identification markings with designations used in panelboards, shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installation.
  
- L. Apply warning, caution, and instruction signs and stencils as follows:

1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic laminated instruction signs with approved legend where instruction or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.
    - a. In addition to the above:
      - 1) Warning signs shall be included on door, or immediately above door, of all electrical equipment rooms, or closets containing equipment energized above 150 volts to ground.
      - 2) Warning designations in 1-inch high red letters shall be painted by stencil, or applied with pre-printed adhesive labels, on each pullbox, cabinet, or 10-foot length of exposed raceway stating: "DANGER-KEEP OUT," and stating the voltage of the enclosed conductors (for example, "480 VOLTS"), for all systems of over 150 volts to ground.
  2. Emergency Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instruction on power transfer, load shedding, or other emergency operations.
  3. Permanently mount signs with cadmium plated steel screws or nickel-plated brass bolts.
- M. Install equipment/system circuit/device identification as follows:
1. Apply equipment identification labels of engraved plastic-laminate (fastened with self-tapping or threaded screws) on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with a minimum of 1/4-inch-high lettering on 1-1/2-inch-high label (2-inch-high where two lines are required), white lettering in black field. Adhesive letters are not acceptable. Text shall match terminology and numbering shown, if provided. For emergency systems, the background field shall be red and include the word, "EMERGENCY." Apply label for each unit of the following categories of electrical equipment:
    - a. Panelboards, electrical cabinets, and enclosures.
    - b. Access doors and panels for concealed electrical items.
    - c. Electrical switchgear and switchboards.
      - 1) State rating, including voltage, continuous current, horsepower or maximum current switching.
      - 2) For enclosed circuit breakers, state voltage, continuous current, maximum interrupting current and trip current.
      - 3) If fused with current-limiting protective devices, include nameplate stating: "Fuses Must Be Replaced With Current Limiting Type of Identical Characteristics."

- d. Electrical substations.
- e. Motor control centers.
- f. Motor controllers.
  - 1) Include voltage, current, horsepower, and trip setting of motor running overcurrent protection.
- g. Pushbutton stations.
- h. Power transfer equipment.
  - 1) For transfer switches, include voltage, current and interrupting or withstand current.
- i. Contactors.
  - 1) Include voltage, continuous current, horsepower or interrupting current, and whether "mechanically-held" or "electrically-held."
- j. Remote-controlled switches.
- k. Dimmers.
- l. Control devices.
- m. Transformers.
- n. Inverters.
- o. Rectifiers.
- p. Lighting system relay cabinets.
- q. Battery racks.
- r. Power generating units.
- s. Telephone switching equipment.
- t. Clock/program master equipment.
- u. Fire alarm master station or control panel, annunciators.
- v. Security monitoring master station or control panel.

N. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm / signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

O. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

END OF SECTION 260553

## SECTION 260573 - PROTECTIVE DEVICE COORDINATION STUDY

## PART 1 - GENERAL

## 1.1 SCOPE OF WORK

- A. Short Circuit Studies, Protective Device Evaluation Studies, and Protective Device Coordination Studies shall be provided by the switchboard/switchgear manufacturer. The studies shall be submitted to the Engineer prior to receiving final approval of the distribution equipment shop drawings and / or prior to release of equipment for manufacture. If formal completion of the studies may cause delay in equipment manufacture, approval from the Engineer may be obtained for a preliminary submittal of sufficient study data to ensure that the selection of device ratings and characteristics will be satisfactory.
- B. The studies shall include all portions of the electrical distribution system from the normal and emergency power source or sources down to and including the 12kV, 480V and 208V distribution system. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.
- C. The Short Circuit Study shall be in accordance with the latest revisions of ANSI C37.5, IEEE Std. 399 and IEEE Std. 141.

## 1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Submittals: Sections 260501 and 01300.

## 1.3 SHORT CIRCUIT STUDY

- A. The study input data shall include the power company's short circuit contribution, resistance and reactance components of the branch impedances, the X/R ratios, base quantities selected, and other source impedances.
- B. Short circuit momentary duty values and interrupting duty values shall be calculated on the basis of assumed three-phase bolted short circuits at each switchgear bus, medium voltage controller, switchboard, low voltage motor control center, distribution panelboards, pertinent branch circuit panel, and other significant locations through the system. The short circuit tabulations shall include symmetrical fault currents, and X/R ratios. For each fault locations, the total duty on the bus, as well as the individual contribution from each connected branch, shall be listed with its respective X/R ratio.

## 1.4 PROTECTIVE DEVICE EVALUATION STUDY

- A. A protective device evaluation study shall be performed to determine the adequacy of circuit breakers, molded case switches, automatic transfer switches, and fuses by tabulating and comparing the short circuit ratings of these devices with the calculated fault current. Appropriate multiplying factors based on system X/R ratios and protective device rating

standards shall be applied. Any problem areas or inadequacies in the equipment due to short circuit currents shall be promptly brought to the Engineer's attention.

#### 1.5 PROTECTIVE DEVICE COORDINATION STUDY

- A. A protective device coordination study shall be performed to provide the necessary calculations and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. The objective of the study is to obtain optimum protective and coordination performance from these devices.
- B. The coordination study shall include all medium and low voltage classes of equipment from the utility's incoming line protective device down to and including the largest rated device in the 480 volt MCC and panelboard. The phase and ground overcurrent protection shall be included, as well as settings of all other adjustable protective devices.
- C. The time-current characteristics of the specified protective devices shall be drawn on log-log paper. The plots shall include complete titles, representative one-line diagram and legends, associated power company's relays or fuse characteristics, significant motor starting characteristics, complete parameters of transformers, complete operating banks of low voltage circuit breaker trip curves and fuses. The coordination plots shall indicate the types of protective devices selected, proposed relay taps, time dial and instantaneous trip settings, transformer magnetizing inrush and ANSI transformer withstand parameters, cable thermal overcurrent withstand limits and significant symmetrical and asymmetrical fault currents. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves shall be maintained. The coordination plots for phase and ground protective devices shall be provided on a system basis. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.
- D. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios and connections, manufacturer and type, range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for the medium voltage fuses where applied in the system. Any discrepancies, problem areas, or inadequacies shall be promptly brought to the Engineer's attention.

#### 1.6 STUDY REPORT

- A. The results of the power system study shall be summarized in a final report. Five (5) bound copies of the final report shall be submitted.
- B. The report shall include the following sections:
  - 1. Description, purpose, basis and scope of the study and a single line diagram of that portion of the power system which is included within the scope of the study.
  - 2. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
  - 3. Protective device time versus current coordination curves, tabulations of relay and circuit breakers trip settings, fuse selection, and commentary regarding same.

4. Fault current calculations including a definition of terms and guide for interpretation of computer printout.

1.7 PROTECTIVE DEVICE TESTING, CALIBRATION AND ADJUSTMENT

- A. The equipment manufacturer shall provide the services of a qualified field engineer and necessary tools and equipment to test, calibrate and adjust the protective relays and circuit breaker trip devices as recommended in the power system study.

END OF SECTION 260573



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SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:

1. Dry type transformers.

B. Related Sections:

1. General electrical requirements: Section 260501.

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including General- and Supplementary-Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 16.

B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:

1. American National Standards Institute  
ANSI/IEEE C57.12.80 Terminology for Power and Distribution Transformers
2. ASTM American Society for Testing and Materials
3. IEEE Institute of Electrical and Electronics Engineers
4. NEC National Electrical Code (NFPA 70)
5. NECA National Electrical Contractors Association "Standard of Installation"
6. National Electrical Manufacturers Association  
NEMA ST 1 Specialty Transformers  
NEMA ST 20 Dry Type Transformers for General Applications  
NEMA TP 1 Guide for Determining Energy Efficiency for Distribution Transformers  
NEMA TP 2 Standard Test Method for Measuring the Energy Consumption of Distribution Transformers
7. NFPA National Fire Protection Association
8. Underwriters Laboratories, Inc.  
UL 486A Wire Connectors and Wiring Lugs for Use with Copper Conductors  
UL 486B Wire Connectors for Use with Aluminum Conductors

1.3 SUBMITTALS

A. General: Submit the following in accordance with the General- and Supplementary-Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."

- B. Shop Drawings and Product Data: Submit for each type of product specified. Include outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, tap and winding configurations, sound level characteristics, insulation system type, and rated temperature rise.
  - 1. Submit test reports with loss data, efficiency at 25/50/75/100 percent rated load, and sound level.
- C. Operating, Maintenance, and Instructional Data: Manufacturers’ written operating, maintenance, and installation instructions, including directions for storage and protection, handling, examination, and preparation.
  - 1. In addition, include copies of this data in Operating and Maintenance Manuals submitted, see Section 260501.
- D. Certificates:
  - 1. Labels of UL listing, fixed to each item of material.
  - 2. Product test reports, including certified copies of manufacturer’s design and routine (production) factory tests required by the referenced standards.

1.4 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation".
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General- and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer’s instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown prior to commencing the work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. General Electric Co.
- B. International Transformer Co.
- C. Square "D".
- D. Cutler-Hammer.
- E. Siemens

2.2 MATERIALS

- A. Description: ANSI/NEMA ST 20; factory-assembled, air-cooled dry type energy efficient transformers; ratings as shown on Drawings. Transformer shall be low loss type with minimum efficiencies per NEMA TP1 when operated at 35% of full load capacity. Efficiency shall be tested in accordance with NEMA TP2. Transformer shall be marked with the Energy Star label.

SINGLE PHASE		THREE PHASE	
<u>KVA</u>	<u>Efficiency</u>	<u>KVA</u>	<u>Efficiency</u>
15	97.7%	15	97.0%
25	98.0%	30	97.5%
37.5	98.2%	45	97.7%
50	98.3%	75	98.0%
75	98.5%	112.5	98.2%
100	98.6%	150	98.3%
167	98.7%	225	98.5%
250	98.8%	300	98.6%
333	98.9%	500	98.7%
750	98.8%		

- B. Insulation system and average winding temperature rise for rated kVA as follows:
  1. 1-15 kVA: NEMA Class 185 with 115 degrees C rise.
  2. 16-500 kVA: NEMA Class 220 with 150 degrees C rise.
- C. Case temperature: Do not exceed 40 degrees C (maximum) and 30 degrees C (average) rise above ambient at warmest point at full load.
- D. Winding Tape:

1. Transformers less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
2. Transformer 15 kVA and larger; four 2-1/2 percent FCBN tapes and 2 above.

E. Sound Levels: Maximum sound levels are as follows:

<u>KVA Rating</u>	<u>Sound Level</u>
15	45db
30	45db
45	45db
75	50db
112.5	50db
150	50db
225	55db

- F. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30kV for transformers 300 kVA and larger.
- G. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- H. Mounting:
1. 1-15 kVA: Suitable for wall mounting.
  2. 16-75 kVA: Suitable for wall, floor, or trapeze mounting.
  3. Larger than 75 kVA: Suitable for floor, or trapeze mounting.
- I. Coil Conductors: Continuous aluminum (unless otherwise shown) windings with termination brazed or welded.
- J. Enclosure: NEMA ST 20, Type 1 or 3R, ventilated, as indicated on the Drawings. Provide lifting eyes or brackets.
- K. Isolate core and coil from enclosure using vibrating-absorbing mounts.
- L. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Secure floor mounted transformers to floor with bolts per DSA approved plans.
- B. Set transformers plumb and level.
- C. Install transformer ventilation openings not closer than 6 inches from any wall surface, or as

indicated in the manufacturer's installation manual when greater distances are required.

### 3.2 VOLTAGE ADJUSTMENT

- A. When final connection has been made, check secondary voltage at dry type transformers and make tap adjustments required to obtain correct voltage.

### 3.3 VIBRATION ISOLATION

- A. Provide isolation procedures described below in addition to those provided by the transformer manufacturer:
  - 1. For floor transformer installation, use pad type vibration isolators, Korfund Elasto-Grip, waffle, or equal, sized to load 50 pounds per square inch. Install one at each corner of the transformer.

### 3.4 CONNECTIONS

- A. Provide solderless lug bonding connection on the inside of the transformer enclosure in accordance with NEC.
- B. Make primary and secondary connections with liquid tight flexible metal conduit to prevent transformer vibration from being transferred to the building structure of conduit system.

END OF SECTION 262213

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SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:

1. Branch circuit and distribution panelboards, both circuit breaker- and fused switch-type, rated 600 volts and below.

B. Related Sections:

1. General electrical requirements: Section 260501.

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including General- and Supplementary-Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.

B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:

1. ANSI American National Standards Institute
2. ASTM American Society for Testing and Materials
3. IEEE Institute of Electrical and Electronics Engineers
4. NEC National Electrical Code (NFPA 70)
5. NECA National Electrical Contractors Association "Standard of Installation"
6. National Electrical Manufacturers Association
  - NEMA AB 1 Molded Case Circuit Breakers
  - NEMA ICS 2 Industrial Control Devices, Controllers, and Assemblies
  - NEMA PB 1 Panelboards
  - NEMA PB 1.1 Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less
7. NFPA National Fire Protection Association
8. Underwriters Laboratories, Inc.
  - UL 50 Cabinets and Boxes
  - UL 67 Panelboards

1.3 SUBMITTALS

A. General: Submit the following in accordance with the General- and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."



- B. Shop Drawings: Include layouts showing cabinet dimensions, conduit entrances, electrical ratings, bussing connections, single line diagrams, device locations and ratings, and cable termination provisions.
- C. Product Data: Submit for each type of product specified.
- D. Operating, Maintenance, and Instructional Data: Manufacturers' written operating, maintenance, and installation instructions, including directions for storage and protection, handling, examination, and preparation.
  - 1. In addition, include copies of this data in Operating and Maintenance Manuals submitted, see Section 260501.
- E. Samples: Provide samples upon specific request.
- F. Certificates:
  - 1. Labels of UL listing, fixed to each item of material.
    - a. Label of UL listing for service entrance use, where applicable, affixed to material.

1.4 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation."
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

## 1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown prior to commencing the work.

## PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

- A. Siemens
- B. General Electric
- C. Square D
- D. Cutler-Hammer

## 2.2 MATERIALS

- A. Branch circuit panelboards:
  - 1. Provide factory assembled, enclosed panelboards in dead front cabinets, with doors, surfaced mounted or recessed as indicated, not less than 20" wide and 5-3/4" deep. Height will depend on the number of breakers and spaces.
  - 2. Where a control compartment is indicated, provide an integral compartment with a separate hinged lockable door held with captive screws.
  - 3. Provide feeder terminal lugs for both main lugs only and main breakers rated for use with copper or aluminum conductors.
  - 4. Provide three phase, 4 wire, solid neutral design with sequence bussing, full capacity neutral and full length copper bussing including areas indicated as space only. Bussing shall be braced for maximum available fault.
  - 5. Provide copper neutral bus where neutral bus is indicated. Neutral bus shall be sized for minimum twice the current carrying capacity of line bus.
  - 6. Key all door locks alike. Provide a type written directory of circuit index card holder mounted behind the door in framed card slot with plastic see through window.
  - 7. Provide full size copper equipment ground bus.
  - 8. All breakers shall be bolt-on type molded case. No tie handle is accepted for multi-pole breaker.
  - 9. Provide pad lock off devices on all breakers serving appliances, motor operated equipment, HVAC equipment and other circuit as indicated on panel schedules.
  - 10. 120/208V, 3 Phase, 4 Wire Panelboards: General Electric Co. type NLAB, Square D Co. type NQOB, or Cutler-Hammer type POW-R-LINE1.
  - 11. 277/480V, 3 Phase, 4 Wire Panelboards: General Electric Co. type NHB, Square D Co. type NEHB, ITE, Inc. type NHB, Sylvania Co. type NH1B or Cutler-Hammer type POW-R-LINE2.
  - 12. All equipment shall be listed to meet or exceed the available fault current indicated on drawings.
  - 13. Provide main lugs only unless scheduled otherwise.
  - 14. Construct in accordance with U.L. and NEMA Standards.

B. Distribution Panelboards:

1. Provide circuit breaker type distribution panelboards with fully rated copper bus, lockable molded case breakers for mains and feeders. Provide nameplates for all circuit breakers.
2. Busing shall be braced to withstand maximum available fault current indicated on drawings.
3. Provide copper neutral bus where indicated. Neutral bus shall be sized for minimum twice the current carrying capacity of line bus.
4. Provide full size copper ground bus adequate for number of grounded circuits.
5. General Electric Co. type NCP and type CCB, or Square D Co. types HCN and HCM, or Cutler-Hammer type POW-R-LINE3 and POW-R-LINE4B.

C. Circuit breakers:

1. Resettable, quick-make, quick-break, bolt-in place type, trip-free, with separate trip position from on and off positions.
2. Multiple pole breakers with common trip and one operation handle.
3. Do not provide handle ties.
4. Wire with sequence phasing.
5. Circuit breakers shall be rated to meet or exceed the available fault current indicated on drawings.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Carefully measure and lay out exact locations of panelboards in conference with Owner.
- B. Assure that panelboards may be installed without adversely affecting the integrity and appearance of the building structure and with the clearances required by the National Electrical Code.

3.2 INSTALLATION

- A. Provide panelboards of the types and ratings scheduled where indicated and mount per DSA approved plans.
- B. Provide flush or surface mounted types where indicated and scheduled.
  1. Provide multi-section cabinets as required and scheduled.
  2. Provide 2 keys for each panelboard.
- C. Provide supports to the building structure, independent of raceways.
- D. Install tops of cabinets at 6 feet 6 inches above finished floor.

- E. Install panelboards in cabinets, centered in door openings.
- F. Secure panelboards to building structure to withstand wire pulling strains.
- G. Secure surface mounted panelboards to wood studs or channel material spanning metal studs.
- H. Do not use toggle bolts.
- I. Provide identification:
  - 1. For panelboards: Engraved, lamacoid plastic nameplate, white with black letters, giving panelboard designation, voltage, phase, wire and ampacity.
  - 2. For branch circuit panelboards: Neatly typewritten circuit directory in cardholder inside panelboard door. Identify rooms served using room numbers corresponding to those finally established at the project.
  - 3. All nameplates to be stainless steel screw on types, no cement.

### 3.3 FIELD QUALITY CONTROL

- A. Perform manufacturer's recommended field test prior to energization.
- B. Provide copies of test results to Owner.

END OF SECTION 262416

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SECTION 262716 - ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. Outlet and device boxes.
2. Pull and junction boxes.
3. Floor boxes and service fittings.
4. Boxes and fittings for hazardous locations.
5. Cabinets.
6. Hinged door enclosures.

B. Related Sections:

1. General electrical requirements: Section 260501.

C. The following related items are specified in Section 260533 - Raceways: conduit-body-type electrical enclosures and wiring fittings, wireways, and auxiliary gutters.

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.

B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:

1. ANSI American National Standards Institute.
2. American Society for Testing and Materials.  
ASTM 123 Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.  
ASTM 167 Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
3. IEEE Institute of Electrical and Electronics Engineers.
4. NEC National Electrical Code (NFPA 70).
5. National Electrical Manufacturers Association.  
NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).  
NEMA ICS6 Enclosures for Industrial Controls and Systems.  
NEMA OS1 Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.  
NEMA OS2 Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
6. NFPA National Fire Protection Association
7. Underwriters Laboratories, Inc.  
UL 50 Electrical Cabinets and Boxes.

- UL 514A Electrical Metallic Outlet Boxes.
- UL 514B Fittings for Conduit and Outlet Boxes.
- UL 514C Nonmetallic Outlet Boxes, Flush-Device Boxes and Covers.
- UL 886 Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations.

### 1.3 SUBMITTALS

- A. In addition to this Section, the submittal requirements of Section 260501, "General Electrical Requirements" are applicable.
- B. Product data: Boxes, cabinets, and fittings.
- C. Shop drawings: Provide for boxes, cabinets, and enclosures that are to be shop fabricated (non-stock items). For shop fabricated junction and pull boxes, show accurately scaled views and spatial relationships to adjacent equipment. Show box types, dimensions and finishes. For cabinets and hinged enclosures, drawings shall include dimensions, knockout sizes and locations, material types and gauges, finishes, and installation method.
- D. Certificates shall include labels of Underwriters' Laboratories, Inc., and National Electrical Manufacturer's Association affixed to each item.
- E. Record actual locations and mounting heights of outlet-, pull-, and junction-boxes, and cabinets and hinged door enclosures, on project record documents.

### 1.4 DEFINITIONS

- A. Cabinet: An enclosure designed either for surface or for flush mounting and having a frame, or trim in which a door or doors may be mounted.
- B. Device Box: An outlet box designed to house a receptacle device or a wiring box designed to house a switch.
- C. Enclosure: A box, case, or cabinet, or housing for electrical wiring or components.
- D. Hinged Door Enclosure: An enclosure designed for surface mounting and having swinging doors or covers secured directly to and telescoping with the walls of the box.
- E. Outlet Box: A wiring enclosure where current is taken from a wiring system to supply utilization equipment.
- F. Wiring Box: An enclosure designed to provide access to wiring systems or for the mounting of indicating devices or of switches for controlling electrical circuits.

### 1.5 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."

- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation."
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.6 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

1.7 PROJECT CONDITIONS AND SITE CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify locations of boxes, cabinets, and enclosures prior to rough-in.
- C. Placement shown on Drawings in approximate locations unless dimensioned. Install as required to complete wiring system.

1.8 SEQUENCING

- A. Install boxes, cabinets, and enclosures in coordination with other work, and at times required to prevent delays in the work and to avoid cutting of masonry units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Subject to compliance with requirements, provide products by the following, or equal:

- A. General:

Appleton Electric Company  
 Hubbell  
 Steel City  
 O.Z./Gedney  
 Hoffman  
 Circle AW

- B. Boxes and fittings for hazardous locations:



Crouse Hinds  
 Killark Electric Mfg.  
 Robroy Industries  
 Spring City Electrical Mfg.  
 Woodhead Industries

C. Floor Boxes:

Hubbell  
 Raco  
 Thomas & Betts  
 Walker  
 Wiremold

D. Cabinets:

Circle AW  
 Hoffman Engineering  
 Spring City Electrical Mfg.

2.2 GENERAL

Of indicated types, sizes, and NEMA enclosure classes. Where not indicated, provide units of types, sizes, and classes appropriate for the use and location. Provide all items complete with covers and accessories required for the intended use. Provide gaskets for units in damp or wet locations.

A. Materials and Finishes:

1. Sheet steel: Flat-rolled, code-gauge, galvanized steel.
2. Fasteners for general use: Corrosion-resistant screws and hardware, including cadmium and zinc-plated items.
3. Fasteners for wet or damp locations: Stainless steel screws and hardware.
4. Cast metal for boxes, enclosures and covers: Copper-free aluminum except as otherwise indicated.
5. Exterior finish: Gray-baked enamel for items exposed in finished locations except as otherwise indicated.
6. Painted interior finish: Where indicated, white baked enamel.
7. Fittings for boxes, cabinets, and enclosures: Conform to UL 514B. Malleable iron or zinc-plated steel for conduit hubs, bushings and box connectors.

2.3 METAL OUTLET, DEVICE, AND SMALL WIRING BOXES

- A. General: Conform to UL 514A and UL 514B. Boxes shall be of type, shape, size, and depth to suit each location and application.
- B. Steel Boxes: NEMA OS 1. Boxes shall be sheet steel with stamped knockouts, threaded screw holes and accessories suitable for each location including mounting brackets and straps, cable clamps, exterior rings and fixture studs.

- C. Cast Aluminum Boxes: Copper-free aluminum with gasketed covers, threaded raceway entries, and features and accessories suitable for each location including mounting ears, threaded screw holes for devices and closure plugs.
- D. Cast Iron Boxes: Iron alloy, waterproof, with gasketed covers and threaded raceway entries, and features and accessories suitable for each location including mounting ears, threaded screw holes for devices and closure plugs.
- E. Floor Boxes:
  - 1. Cast Iron Floor Boxes: Fully-adjustable, waterproof, with threaded raceway entrances, adjusting rings, gaskets, and brass floor plates. Where indicated, provide multi-section boxes with individual hinged section covers and provide for a duplex receptacle under one or more of the covers.
  - 2. Steel Floor Boxes: Sheet steel, concrete tight, fully adjustable, with stamped knockouts, adjusting rings, and brass floor plates. Where indicated, provide multi-section boxes with concealed individual section covers under a common flush floor plate. Provide for a duplex receptacle in one of the concealed section covers and a one inch diameter bushed opening in the other.
  - 3. Service Fittings for Floor Outlet Boxes: Surface mounted horizontal, cast aluminum type, three inches high, suitable for finished spaces and finished in stain aluminum, except where otherwise indicated. Provide duplex receptacle or one inch diameter bushed opening for telephone or other communications service as indicated. Equip fitting for attaching flat to floor box cover.

#### 2.4 NONMETALLIC OUTLET, DEVICE, AND SMALL WIRING BOXES

- A. General: Conform to NEMA OS 2, and UL 514B and 514C. Boxes shall be high-impact resistant molded PVC units with covers and integrally-molded raceway entrance hubs and removable mounting flanges. Boxes shall be equipped with threaded screw holes for device and cover plate mounting, be equipped with an integral ground lug, and be of the type, shape, size, and depth to suit location and application.
  - 1. Boxes for Concealed Work: Mounting provisions and wiring entrances to suit installation conditions and wiring method used.
  - 2. Boxes for Exposed Work: Ultraviolet-stabilized, non-conductive, high impact-resistant boxes with integrally-molded raceway entrance hubs and removable mounting flanges. Boxes shall be equipped with threaded screw holes for device and cover plate mounting. Each box shall have a molded cover of matching PVC material suitable for the application.

#### 2.5 PULL AND JUNCTION BOXES

- A. General: Conform to UL 50, for boxes over 100 cubic inches in volume. Boxes shall have bolted-on covers of material same as box, and shall be of the size and shape to suit the application.
- B. Steel Boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing.

- C. Hot-Dip Galvanized Steel Boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing. Hot-dip galvanize after fabrication. Cover shall be gasketed.
- D. Stainless Steel Boxes: Fabricate of stainless steel conforming to Type 302 of ASTM A 167. Where necessary to provide a rigid assembly, construct with internal structural stainless steel bracing. Cover shall be gasketed.
- E. Cast Iron Boxes: Molded of cast iron alloy with gasketed cover and integral threaded conduit entrances.
- F. Cast Nonmetallic Boxes: Ultraviolet stabilized, non-conductive, high impact-resistant PVC boxes with gasketed cover and integral mounting flanges.
- G. Boxes Approved for Classified Locations: UL 886. Cast metal or cast nonmetallic boxes, listed and labeled for use in the specific location classification, and with the specific hazardous material encountered. Conduit entrances shall be integral threaded type.

## 2.6 CABINETS

- A. General: Conform to UL 50.
- B. Construction: Sheet steel, NEMA 1 class except as otherwise indicated. Cabinet shall consist of a box and a front consisting of a one-piece frame and hinged door. Arrange door to close against a rabbet placed around the inside edge of the frame, with a uniformly close fit between door and frame. Provide concealed fasteners, not over 24 inches apart, to hold fronts to cabinet boxes and provide for adjustment. Provide flush or concealed door hinges not over 24 inches apart and not over 6 inches from top and bottom of door. For flush cabinets, make the front approximately 3/4 inch larger than the box all around. For surface mounted cabinets make front same height and width as box.
- C. Doors: Double doors for cabinets wider than 24 inches. Telephone cabinets wider than 48 inches may have sliding or removable doors.
- D. Locks: Combination spring catch and key lock, with all locks for cabinets of the same system keyed alike. Locks shall be of a type to permit doors to latch closed without locking.

## 2.7 STEEL ENCLOSURES WITH HINGED DOORS

- A. General: Conform to UL 50.
- B. Construction: Sheet steel, 16 gauge minimum, with continuous welded seams. NEMA class as indicated, arranged for surface mounting.
- C. Doors: Hinged directly to cabinet and removable, with approximately 3/4 inch flange around all edges, shaped to cover edge of box. Provide handle-operated key locking latch. Individual door width shall be no greater than 24 inches. Provide multiple doors where required.
- D. Mounting Panel: Provide painted removable internal mounting panel for component installation.

- E. Enclosure: NEMA 12, except as indicated. Where door gasketing is required, provide neoprene gasket attached to oil-resistant adhesive, and held in place with steel retaining strips. For all enclosures of class higher than NEMA 1, use hubbed raceway entrances.

## 2.8 CAST METAL ENCLOSURES WITH HINGED DOORS

- A. Copper-free aluminum with bolted, hinged doors. Where used at classified locations, enclosures shall conform to UL and shall be listed and labeled for the classification of hazard involved.

## 2.9 MOLDED NONMETALLIC ENCLOSURES WITH HINGED DOOR

- A. General: Molded, glass fiber reinforced high impact strength polyester with bolt or screw-secured doors and solid neoprene gaskets.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Outlet Boxes and Fittings: Install outlet and device boxes and associated covers and fittings of materials and NEMA types suitable for each locations and in conformance with the following requirements, except as otherwise indicated:

1. Interior dry locations: NEMA type 1, sheet steel UON
  - a. In dry walls for single and two gang outlets provide 4S and 4D boxes, for 3 or more outlets use masonry boxes.
  - b. In block and masonry walls provide masonry boxes of depths required for wall thickness.
  - c. In poured concrete and plastered walls provide 4S and 4D boxes for single gang outlets and 2G and 3G-5075 boxes for multiple ganged outlets.
  - d. In concrete ceilings provide OCR rings. In other ceilings provide 40 and 40D boxes. Omit covers if standard canopy and device plates entirely cover the ceiling opening.
2. Locations exposed to weather or dampness: Cast metal UON NEMA type 3R.
3. Wet locations: NEMA type 4 enclosures.
  - a. In exposed work, exterior of buildings, in wet location, and flush in non-waterproofed walls below grade provide FS and FD boxes.
4. Corrosive locations: NEMA type 4X enclosures.
5. Hazardous (Classified) locations: Cast metal, UL 886, NEMA type listed and labeled for the location and class of hazard indicated.

- B. Pull and Junction Boxes: Install pull and junction boxes of materials and NEMA types as follows, except as otherwise indicated:

1. Interior dry locations: NEMA type 1, sheet steel.

2. Locations exposed to weather or dampness: NEMA type 3R, sheet steel.
  3. Wet locations: NEMA type 4 enclosures.
  4. Corrosive locations: NEMA type 4X enclosures.
  5. Hazardous (Classified) locations: Cast metal, UL 886, NEMA type listed and labeled for the location and class of hazard indicated.
- C. Floor Boxes: In slabs on grade and wet locations: Use NEMA type 4 boxes. At other locations in slabs, use concrete-tight NEMA 1 boxes.
1. Provide floor boxes with quantity of gangs as required for power, communication or control as indicated. Use boxes with barriers where required. Provide carpet flanges in carpeted areas.
- D. Hinged Door Enclosures: NEMA type 12, except as indicated.
- E. Hinged Door Enclosures Outdoors: NEMA type 3R, with drip hood, factory tailored to individual units.
- F. Hinged Door Enclosures in Corrosive Locations: NEMA type 4X nonmetallic enclosure.
- G. Cabinets: Flush mounted, NEMA enclosure type 1, except as otherwise indicated.
- 3.2 INSTALLATION, GENERAL
- A. Locations: Install items where indicated and where required to suit code requirements and installation conditions.
  - B. Cap unused knockout holes where blanks have been removed and plug unused conduit hubs. Provide standard manufactured plugs in unused openings of boxes.
  - C. Support and fasten items securely in accordance with Division 26 Section "Supporting Devices."
  - D. Sizes shall be adequate to meet NEC volume requirements, but in no case smaller than sizes indicated.
  - E. Remove sharp edges where they may come in contact with wiring or personnel.
  - F. Do not provide through-the-wall and back-to-back boxes. Provide minimum 24" between outlet boxes on all fire-rated walls.
  - G. Provide boxes at the terminal of conduit runs to outlets and devices.
  - H. Center outlets in paneling and in other Architectural features.
  - I. Locate light fixture outlets in uniform relation with ceiling tiles.
  - J. Group outlets on circuits with homeruns as indicated on the drawings.
  - K. Provide plaster rings and covers where required by the building structure.

### 3.3 INSTALLATION OF OUTLET BOXES

- A. Outlets at windows and doors: Locate close to window trim. For outlets indicated above doors, use 6 feet-9 inches mounting height above finished floor and center outlets above the door opening except as otherwise indicated.
- B. Column and pilaster locations: Locate outlet boxes for switches and receptacles on columns or pilasters so the centers of the columns are clear for future installation of partitions.
- C. Locations in special finish materials: For outlet boxes for receptacles and switches mounted in desks or furniture cabinets or in glazed tile, concrete block, marble, brick, stone or wood walls, use rectangular shaped boxes with square corners and straight sides. Install such boxes without plaster rings. Sawcut all recesses for outlet boxes in exposed masonry walls.
  - 1. Provide 1" deep plaster rings on recessed outlet boxes installed in areas where concrete will be exposed after construction is complete.
  - 2. Where boxes are concealed in exposed concrete unit masonry, use square cornered type boxes, or boxes fitted with rings of sufficient depth for the box to be recessed completely within cavity of block or tile. Install box to insure that ring fits an opening sawed out of the masonry, so that no mortar is required to fill between ring and construction.
- D. Gasketed boxes: At the following locations use cast metal, threaded hub-type boxes with gasketed weatherproof covers:
  - 1. Exterior locations.
  - 2. Where surface mounted on unfinished walls, columns or pilasters. (Cover gaskets may be omitted in dry locations.)
  - 3. Where exposed to moisture-laden atmosphere.
  - 4. At food preparation equipment within four feet of steam connections.
  - 5. Where indicated.
- E. Cast iron boxes: Iron alloy, waterproof, with threaded raceway entries and features and accessories suitable for each location, including mounting ears, threaded screw holes for devices and closure plugs.
- F. Mounting: Mount outlet boxes for switches with the long axis vertical or as indicated. Mount boxes for receptacles either vertically or horizontally but consistently either way. Three or more gang boxes shall be mounted with the long axis horizontal. Locate box covers or device plates so they will not span different types of building finishes either vertically or horizontally. Locate boxes for switches near doors on the side opposite the hinges and close to door trim, even though electrical floor plans may show them on hinge side.
  - 1. Provide 3/8 inch studs in ceiling- and wall-mounted lighting fixture outlet boxes where shop drawings of fixtures require and elsewhere as may be required for fixtures.
- G. Ceiling outlets: For fixtures, where wiring is concealed, use octagonal outlet boxes, 4 inches by 2 inches deep, minimum.
- H. Cover plates for surface boxes: Use plates sized to box front without overlap.

- I. Protect outlet boxes to prevent entrance of plaster and debris. Thoroughly clean foreign material from boxes before conductors are installed.
- J. Floor boxes: Install in concrete floor slabs so they are completely enveloped in concrete except for the top. Where normal slab thickness will not envelop box as specified above, provide increased thickness of the slab. Provide each compartment of each floor box with grounding terminal consisting of a washer-in-head machine screw, not smaller than No. 10-32, screwed into a tapped hole in the box. Adjust covers of floor boxes flush with finished floor.

### 3.4 INSTALLATION OF PULL AND JUNCTION BOXES

- A. Pull boxes and junction boxes shall be securely mounted to the building structure.
  - 1. Fastenings shall be made by means of not smaller than 3/16" diameter bolts, expansion bolts, or toggle bolts; not smaller than No. 9" x 1" wood screws; or by equivalent fastenings; where exposed to weather or moisture, shall be galvanized. Do not use nails, or wood or fiber inserts in masonry.
  - 2. On masonry or concrete walls, columns or flooring, fastenings shall be made by means of lead expansion shields not smaller than size 3/8" diameter by 5/8" long for use with No. 10-24 round head machine screws. Machine screws shall be not less than 1-1/4" long for installation on ceiling and not less than 1" long elsewhere.
    - a. Holes for lead expansion shields shall be carefully and accurately drilled, using sharp drills to a depth which will afford the maximum practical engagement of threads (depth equal to screw length not less than 1-1/4" past plaster into solid concrete). Installation shall develop full strength of screw.
- B. Pullboxes for concealed wiring shall be mounted flush in walls, partitions, and ceilings, unless otherwise indicated.
  - 1. Use cast iron boxes flush in slab on grade.
- C. Box Selection: For boxes in main feeder conduit runs, use sizes not smaller than 8-inches square by 4-inches deep. Do not exceed 6 entering and 6 leaving raceways in a single box.
- D. Cable Supports: Install clamps, grids, or devices to which cables may be secured. Arrange cables so they may be readily identified. Support cable at least every 30 inches inside boxes.
- E. Mount pull boxes in inaccessible ceilings with the covers flush with the finished ceiling.
- F. Size: Provide pull and junction boxes for telephone, signal, and other systems at least 50 percent larger than would be required by NEC Article 370, or as indicated. Locate boxes strategically and provide shapes to permit easy pulling of future wires or cables of types normal for such systems.

### 3.5 INSTALLATION OF CABINETS AND HINGED DOOR ENCLOSURES

- A. Installations shall be secure and substantial; cabinets shall be attached to building walls or structure.

- B. Mount with fronts, trim, and doors straight and plumb.
- C. Install with tops 78 inches above finished floor.
- D. Set cabinets in finished spaces flush with walls.
- E. Identification: Provide identification nameplates on inside and outside of covers and doors on each cabinet and hinged enclosure, engraved bakelite with 1/4 inch minimum height letters, securely fastened with stainless steel screws. Text shall identify the function of the cabinet or enclosure, for example, "Dimming Panel," unless otherwise indicated.

### 3.6 GROUNDING

- A. Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes a grounding conductor, provide a grounding terminal in the interior of the cabinet, box, or enclosure.

### 3.7 CLEANING AND FINISH REPAIR

- A. Upon completion of installation, inspect components. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, abrasions and weld marks. Clean surfaces to be painted.
- B. Galvanized finish: Repair damage using a zinc-rich paint recommended by the manufacturer.
- C. Painted finish: Repair damage using matching corrosion-inhibiting touch-up coating.

END OF SECTION 261716



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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes:

1. Receptacles.
2. Snap Switches.
3. Incandescent Lamp Dimmer-Switches.
4. Fluorescent Lamp Dimmer-Switches.
5. Wall Plates.
6. Floor Service Outlets.
7. Poke-Through Assemblies.
8. Telephone/Power Poles.

B. Related Sections:

1. General electrical requirements: Section 260501.

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.

B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:

1. ANSI American National Standards Institute
2. ASTM American Society for Testing and Materials
3. IEEE Institute of Electrical and Electronics Engineers
4. NEC National Electrical Code (NFPA 70)
5. NECA National Electrical Contractors Association: "Standard of Installation"
6. NEMA National Electrical Manufacturers Association
7. NFPA National Fire Protection Association
8. Underwriters Laboratories, Inc.
  - UL 20 General Use Snap Switches
  - UL 94.3 UL Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
  - UL 486A Wire Connectors and Wiring Lugs for Use with Copper Conductors
  - UL 498 Molded-Case Circuit Breakers and Circuit Breaker Enclosures
  - UL 1010 Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations
  - WD 1 General Requirements for Wiring Devices
  - WD 6 Wiring Device-Dimensional Requirements

1.3 SUBMITTALS

- A. General: Submit the following in accordance with the Conditions of the Contract and Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Product Data: Submit for each type of product specified.
- C. Installation instructions: Manufacturer's written installation instructions for wiring devices. Include instructions for storage, handling, protection, examination, and preparation of Product.
- D. Samples: Provide samples under specific request.

1.4 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation."
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General- and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown prior to commencing the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

Crouse-Hinds  
Hubbell

Pass and Seymour  
 Square D  
 Walker

2.2 WIRING DEVICES

- A. General: Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Verify color of all device plates with Project Architect or Interior Designer prior to placing order.
- B. Receptacles: UL 498 and NEMA WD 6. Straight blade, two-pole, three-wire grounding type, except as otherwise indicated below:

RECEPTACLES: RATINGS AND TYPES [1]					
OUTLET TYPE	CURRENT RATING	VOLTAGE RATING	NEMA CONFIGURATION	UL GRADE	MANUFACTURER [5]
Duplex	20 A	125 V	5-20R	Heavy Duty	Hubbell 5362
Duplex, GFI [2]	20 A	125 V	5-20R	Heavy Duty w/Integral GFI	Hubbell GF5362
Duplex, Hospital	20 A	125 V	5-20R	Hospital	Hubbell 8300
Single	20 A	125 V	5-20R	Heavy Duty	Hubbell 5361
Single	20 A	250 V	6-20R	Heavy Duty	Hubbell 5461
Single, Locking [3]	20 A	125 V	L5-20R	Heavy Duty	Hubbell 2310
Single, Locking [3]	20 A	250 V	L6-20R	Heavy Duty	Hubbell 2320
Pin and Sleeve [4]	As Required	As Required	Not Applicable	498-General; 1010-Classified Locations	Hubbell
Notes: 1. Except as otherwise indicated. 2. GFI receptacles shall protect downstream receptacles on same circuit. 3. Provide locking receptacles with black nylon face, except as otherwise indicated. 4. Provide features indicated. 5. Verify color selection with Architect/Engineer. (As listed, each catalog number specifically indicates the color of the device - revision may be required.)					

- C. Switches: UL 20 and NEMA WD 1. Quiet toggle-type AC switch. Ratings and types, except as otherwise indicated:

SWITCHES: RATINGS AND TYPES [1]				
TYPE	LOAD RATING	VOLTAGE RATING	UL GRADE	MANUFACTURER [4]
Single Pole	20 A	120/277 V	Heavy Duty	Hubbell HBL 1221
Double Pole	20 A	120/277 V	Heavy Duty	Hubbell HBL 1222
Three Way	20 A	120/277 V	Heavy Duty	Hubbell HBL 1223
Four Way	20 A	120/277 V	Heavy Duty	Hubbell HBL 1224

Single Pole w/Pilot Light [2]	20 A	120/277 V	Heavy Duty	Hubbell HBL 1221-PL7
Single Pole w/Key Switch	20 A	120/277 V	Heavy Duty	Hubbell HBL 1221-L
Momentary Contact Type [3]	20 A	120/277 V	Heavy Duty	Hubbell HBL 1557
Notes: 1. Except as otherwise indicated. 2. For switch with pilot light, the light is "ON" when the load is "ON". 3. For momentary contact type switch, operation is three position - two circuit momentary contact and center off. 4. Verify color selection with Architect/Engineer. (As listed, each catalog number specifically indicates the color of the device - revision may be required.)				

D. Dimmer Switches: Solid-state dimmer switches, mount in outlet boxes as indicated and in accordance with the following:

1. Incandescent Lamp Dimmer: Modular type, 120-volts, 60-Hz, switch poles and wattage as indicated, with continuously-adjustable rotary knob or toggle, anodized aluminum face, with soft-tap or other quiet on-off switch. Equip with electromagnetic filter to eliminate noise, RF and TV interference, and 5-inch minimum wire connecting leads. Derate dimmer switch per manufacturer's recommendations where dimmers are ganged together.
2. Fluorescent Lamp Dimmer: Full-wave modular type AC dimmer for fluorescent fixtures; wattage and voltage ratings as indicated, and electromagnetic filter to eliminate noise, RF and TV interference. Construct with continuously-adjustable trim potentiometer with adjustment of low and dimming, anodized heat sinks, with quiet on-off switch and 5-inch minimum wire connecting leads. To ensure coordination with dimming type ballasts in fixtures, specific dimming device shall be approved for use in writing by the ballast manufacturer.

2.3 WIRING DEVICE ACCESSORIES

A. Wall Plates: Single and combination, of types, sizes, and with ganging and cutouts as indicated. Provide plates which mate and match with wiring devices to which they are attached, and are from the same manufacturer. Provide metal screws for securing plates to devices with screw heads colored to match finish of plates. Wall plate color shall be as selected by Architect / Engineer. Provide wall plate color to match wiring devices except as otherwise indicated. Provide wall plates with engraved legend where indicated. Conform to requirements of Section 260553, "Electrical Identification."

1. Interior Areas: Smooth, high-impact resistant plastic, of the same manufacturer as the device.
  - a. Voice, data, or video communications system outlets: Same as for wiring devices except with 3/8 inch or 1 inch rubber grommets as required.
  - b. Surface mounted outlet boxes: Zinc coated sheet steel rounded edges, same size as outlet box.
  - c. Kitchen and food preparation areas: Polished stainless steel type, 0.40 inches thick.
2. Exterior areas: Weatherproof, corrosion-resistant type, die cast aluminum with self-closing gasketed cover. For duplex receptacles, use Hubbell 5206-WO or equal; for wall switches, use Hubbell 7420 or equal; for GFI receptacles, use manufacturer's listed plate.

- B. Floor Service Outlets: Modular, above-floor service outlets and fittings of types and ratings indicated. Construct of die-cast aluminum, satin finish. Use design compatible with floor outlet wiring methods indicated. Provide 20-ampere, 125-volt, gray duplex receptacle. Provide with 3/4 inch or 1-inch NPT, 1-inch long, locking nipple for installation where compatible with wiring method.
- C. Poke-Through Assembly Devices: Factory-fabricated poke-through assembly devices with multi-channeled thru-floor raceway/firestop assembly and below-floor junction box assembly.
1. Above-floor service pedestal: Include service outlets in above-floor four-gang service fitting of die-cast satin-finish aluminum with one 20 ampere, 125 volt, gray NEMA 5-20R duplex receptacle and one duplex modular duplex voice/data communications jack, including separation barrier between line- and low-voltage section. Provide integral assembly UL listed as a total unit, with fire rating consistent with that of floor penetrated. Provide through-floor fitting: Hubbell Type PT7XC, plus a below-floor junction box; and service pedestal: Hubbell Type FR480.
  2. Flush-floor service assembly: Include service outlets in flush-floor brass service fitting with one 20 ampere, 125 volt, NEMA 5-20R duplex receptacle and two openings for up to one 25-pair telephone cable per opening. Provide integral assembly UL listed as a total unit, with fire rating consistent with that of floor penetrated. Receptacle shall be protected when not in use with independent, spring-loaded lift covers. Provide one-piece through-floor fitting including carpet flange: Hubbell Type PT7FBRS2; and duplex receptacle: Hubbell Series 5352.
- D. Telephone/Power Service Poles: Factory-assembled combination telephone/power poles of types, sizes, and ratings indicated; for use with telephone and power systems installed above suspended ceilings. Construct with provisions for one 50-pair telephone cable, and two-20 ampere, 125 volt, three-wire receptacles. Isolate power section from telephone compartment with separating metal barrier. Extend wiring from receptacles to junction box at top of pole where connections are made above suspended ceiling. Provide ceiling trim plate and pole foot with carpet pad. Where poles are located in accessible ceiling areas, provide bracing arranged for positive connection to ceiling supports. Provide finish treatment and color as selected by the Architect/Engineer.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install wiring devices and accessories as indicated, in accordance with manufacturers written instructions, applicable requirements of the NEC, and in accordance with recognized industry practices to fulfill project requirements.
1. Mount switches and receptacles in vertical position in building interiors.
  2. Mount receptacles with weatherproof plates in horizontal position.
  3. Install receptacles mounted vertically so that the ground contact falls on the top position, and horizontally mounted receptacles with neutral pole in top position.
  4. Individually Mounted Dimmers: Install in accordance with manufacturer's ventilation clearance requirements.

- B. Coordinate with other Work, including painting, electrical boxes and wiring installations, as necessary to interface installation of wiring devices with other Work.
- C. Install wiring devices only in electrical boxes which are clean; free from building materials, dirt and debris.
- D. Install wiring devices after wiring work is completed.
- E. Install wallplates after painting work is completed.
- F. Install telephone/power service poles - in accordance with final furnishings arrangement - plumb, true, and secure.
- G. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturers' torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A. Use properly-scaled torque indicating hand tool.

3.2 INSPECTION

- A. Inspect boxes into which wiring devices are to be installed for defects which affect the quality and execution of work.
- B. Do not start work until defects are corrected.

3.3 PREPARATION

- A. Determine where types of wiring devices are to be installed.
- B. Verify devices are of correct size, capacity, type, and NEMA configuration.

3.4 ADJUSTMENT

- A. Align device and cover plate vertically and horizontally assuring flush fitting.

3.5 PROTECTION

- A. Protect installed components from damage. Replace damaged items prior to final acceptance.

3.6 FIELD QUALITY CONTROL

- A. Testing: Prior to energizing circuits, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.
- B. Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer recommendations.

END OF SECTION 262726

SECTION 262801 - LOW-VOLTAGE CIRCUIT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:

1. Circuit breakers and fuses, rated 600 volts and below.
  - a. Also included: enclosed circuit breakers for independent mounting.

B. Related Sections:

1. General electrical requirements: Section 260501.

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including General- and Supplementary-Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 6.

B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:

1. ANSI American National Standards Institute
2. ASTM American Society for Testing and Materials
3. Institute of Electrical and Electronics Engineers  
IEEE 242 Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
4. NEC National Electrical Code (NFPA 70)
5. NECA National Electrical Contractors Association "Standard of Installation"
6. National Electrical Manufacturers Association  
NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum)  
NEMA AB 1 Molded-Case Circuit Breakers  
NEMA FU 1 Low Voltage Cartridge Fuses  
NEMA KS 1 Enclosed Switches
7. NFPA National Fire Protection Association
8. UL Underwriters Laboratories, Inc.  
UL 98 Enclosed and Dead-Front Switches  
UL 198C High-Interrupting-Capacity Fuses, Current-Limiting Type Fuses  
UL 198E Class R Fuses  
UL 198F Plug Fuses  
UL 486A Wire Connectors and Wiring Lugs for Use with Copper Conductors  
UL 486B Wire Connectors for Use with Aluminum Conductors  
UL 489 Molded-Case Circuit Breakers and Circuit Breaker Enclosures



UL 943 Ground-Fault Circuit Interrupters  
 UL 977 Fused Power-Circuit Devices

1.3 SUBMITTALS

- A. General: Submit the following in accordance with the General- and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."
- B. Shop Drawings: Submit shop drawings and or brochures to include but not limited to minimum melting and total clearing time charts for all fuses.
- C. Product Data: Submit for each type of product specified. Include manufacturer's bulletins, and minimum melting and total clearing time charts for each type of fuse.
- D. Operating, Maintenance, and Instructional Data: Manufacturers' written operating, maintenance, and installation instructions, including directions for storage and protection, handling, examination, and preparation.
  - 1. In addition, include copies of this data in Operating and Maintenance Manuals submitted, see Section 260501.
- E. Samples: Provide samples upon specific request.
- F. Certificates:
  - 1. Labels of UL listing, fixed to each item of material.

1.4 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation."
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General-

and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements."

- B. Store and protect product in accordance with manufacturer's instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown prior to commencing the work.

1.7 COORDINATION

- A. For equipment furnished by the Owner, or under other Divisions: Size fuses in accordance with the National Electrical Code.

1.8 EXTRA MATERIALS

- A. Furnish 3 of each type and size of fuse installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Circuit Breakers:
  1. General Electric Co.
  2. Square D Co.
  3. Cutler-Hammer

- B. Fuses:
  1. Bussmann only.

2.2 MATERIALS AND FABRICATION

- A. Circuit Breakers:
  1. Circuit Breakers: Molded case, quick-make, quick-break, thermal-magnetic, trip-free with individual inverse time tripping mechanism on each pole. Terminal lugs rated for copper and aluminum conductors. Minimum 10,000 amperes interrupting capacity, RMS symmetrical short circuit rating shall be required. All breakers shall meet or exceed the maximum available fault current as indicated on single line diagram.
    - a. Use magnetic-only circuit breakers for motor applications.
    - b. Provide Class A (5ma sensitivity) breakers where GFI type breakers are required.
    - c. Provide "HACR" type circuit breakers for HVAC loads. Ratings shall be as indicated on the drawings.
    - d. No tie handle on multi-pole circuit breaker is accepted.

- e. Provide ambient compensated type breaker where the breaker is installed in the ambient in excess of 40 degrees C (104 degrees F).

B. Fuses:

1. Class RK1:
  - a. 250V; LPN-RK, Lowpeak
  - b. 600V; LPS-RK
2. Class L: KRP-C, Hi-Cap
3. Or as otherwise shown on the drawings.

### PART 3 - EXECUTION

#### 3.1 APPLICATION

A. Types: Mains, Feeders and Branch Circuits.

1. 600 Amps and Below: Dual-element construction (current limiting, time-delay and high interrupting capacity) providing thermal protection for both fuse and fuseholder. Interrupting rating shall be 300,000 amperes RMS symmetrical and peak let-thru current and energy let-thru values shall not exceed the values established by Underwriters' Laboratories Standard for Class RK-1 fuses. Fuses shall be Bussmann "Low Peak Yellow™" in color and shall be Bussmann Low-Peak Dual Element Fuses, types LPN-RK (250 volts) or LPS-RK (600 volts). The fuses shall have separate overload and short-circuit elements. The fuses shall incorporate a spring activated thermal overload element having a 284 degree Fahrenheit melting point alloy and shall be independent of the short-circuit clearing chamber. Fuses shall be "Low Peak Yellow™". CAUTION labels to alert the end user of the engineered level of protection of the electrical equipment, shall be field installed by the electrical contractor. They shall be marked with the proper fuse rating, per the specifications, and placed in a conspicuous location on the enclosure. These labels are available with the spare fuse cabinet (SFC) and are also available upon request from Bussmann.
2. Above 600 Amps: Time delay type; shall hold 500% of rated current for a minimum of 4 seconds and clear 20 times rated current in .01 seconds or less. Interrupting ratings shall be 200,000 amperes RMS symmetrical and peak let-thru current and energy let-thru values shall not exceed the values established by Underwriters' Laboratories for Class L fuses. Fuses shall be Bussmann "Low Peak Yellow™" in color and shall be Bussmann LOW PEAK type KRP-C. The fuses shall employ "O" rings as positive seals between the end bells and the glass melamine fuse barrel. The fuse links shall be pure silver links (99.9% pure), to limit the short circuit current let-through values to low levels and comply with NEC Sections requiring component protection. The terminals shall be panned. CAUTION labels to alert the end user of the engineered level of protection of the electrical equipment, shall be field installed by the electrical contractor. They shall be marked with the proper fuse rating, per the specifications, and placed in a conspicuous location on the enclosure. These labels are available with the spare fuse cabinet (SFC) and are also available upon request from Bussmann.

- B. Motor Circuits - All individual motor circuits with full load amperes rating (FLA) of 480 amperes or less shall be protected by BUSSMANN LOW-PEAK Dual-Element, time delay to provide type 2 coordination for the controller, Fuses LPN-RK (250 volts) or LPS-RK (600 volts). The fuses for motors with a marked service factor not less than 1.15 or with a marked temperature rise not over 40 degrees Centigrade, shall be installed in ratings of approximately 125% of motor full load current except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly such as large fans. Under such conditions the fuse should be 150% to 175% of the motor full load current. Larger H.P. motors shall be protected by BUSSMANN Type KRP-C Low-Peak Time-Delay Fuses of the ratings shown on the drawings. All other motors, (such as 1.0 service factor motors) shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) installed in ratings of approximately 115% of the motor full load current except as noted above. The fuses shall be U.L. Class RK1 Dual Element Time Delay or Class L. CAUTION labels to alert the end user of the engineered level of protection of the electrical equipment, shall be field installed by the electrical contractor. They shall be marked with the proper fuse rating, per the specifications, and placed in a conspicuous location on the enclosure. These labels are available with the spare fuse cabinet (SFC) and are also available upon request from Bussmann.
- C. Circuit breaker panels shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) or BUSSMANN Low-Peak KRP-C Time Delay Fuses as shown on the drawings. The fuses shall be U.L. Class RK1 or Class L. Protection shall be based on the circuit breakers interrupting capacity, as outlined in the Bussmann Bulletin PMCB. CAUTION labels to alert the end user of the engineered level of protection of the electrical equipment, shall be field installed by the electrical contractor. they shall be marked with the proper fuse rating, per the specifications, and placed in a conspicuous location on the enclosure. These labels are available with the spare fuse cabinet (SFC) and are also available upon request from Bussmann.
- D. Provide Class RK1 fuses for motors, feeder circuits, and other circuits not specified below 0-600 amps.
- E. Provide Class RK1 fuses for lighting loads, 0-600 amps:
1. For fluorescent ballasts - Type GLR.
  2. For other ballasts and control circuits - Type KTK.
- F. Provide Class L fuses for all applications, 601 amps and larger.
- G. Special Applications:
1. Fluorescent fixtures shall be protected by Bussmann fuses GLR or GMF with holder HLR. They shall have individual protection on the line side of the ballast. A fuse and holder shall be mounted within or as part of the fixture. Size and type of fuse to be recommended by the ballast manufacturer.
  2. All other ballast-controlled lighting fixtures shall be protected by Bussmann fuses type KTK or FNQ with holders HEB, HPF, or HPS. They shall have individual protection on

the line side of the ballast. Fuse and holder shall be mounted in a location convenient for changing fuses. Holder shall be mounted in protected location or be an in-line waterproof holder. Size and type of fuse to be recommended by the ballast manufacturer or as indicated on plans.

### 3.2 INSTALLATION

- A. Set adjustable circuit breakers with trips as indicated.
- B. Provide separate neutral conductors for circuits protected by GFI breakers.
- C. Provide Class RK5 fuses for motors, feeder circuits, and other circuits not specified below 0-600 amps.
- D. Provide Class RK1 fuses for lighting loads, 0-600 amps:
  - 1. For fluorescent ballasts - Type GLR.
  - 2. For other ballasts and control circuits - Type KTK.
- E. Provide Class L fuses for all applications, 601 amps and larger.
- F. Fuses shall be shipped separately. Any fuses shipped installed in equipment, shall be replaced by contractor with new fuses as specified above prior to energization at no additional expense to Owner. All fuses shall be stored in moisture free packaging at job site and shall be installed immediately prior to energization of the circuit in which it is applied.

### 3.3 LABELING AND IDENTIFICATION

- A. Provide engraved plastic nameplates with 1/4-inch minimum height letters indicating:
  - 1. Circuit designation at branch overcurrent devices in distribution panelboards, switchboards and motor control centers.
  - 2. Circuit designation of panel or device controlled on circuit breakers, individually enclosed.
- B. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

### 3.4 SPARES

- A. In addition to fuses consumed during testing, furnish 10%, but not less than three each of each size and type fuses used for the project and store where directed by Owner. Mount spare fuses in a NEMA 1 lockable cabinet with full plywood backboard.

END OF SECTION 262801

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section Includes:

1. Enclosed safety switches for use on feeders and branch circuits, and disconnect switches for motors and equipment.

B. Related Sections:

1. General electrical requirements: Section 260501.

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including General- and Supplementary-Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 26.

B. In addition, the products covered in this Section, except as noted, shall be designed, manufactured, and tested in accordance with the latest revisions of the applicable standards of:

1. ANSI American National Standards Institute
2. ASTM American Society for Testing and Materials.
3. IEEE Institute of Electrical and Electronics Engineers.
4. NEC National Electrical Code (NFPA 70).
5. NECA National Electrical Contractors Association "Standard of Installation".
6. National Electrical Manufacturers Association  
NEMA KS 1 Enclosed Switches
7. NFPA National Fire Protection Association
8. Underwriters Laboratories, Inc.  
UL 98 Enclosed and Dead Front Switches  
UL 198C High-Interrupting Capacity Fuses; Current Limiting Type  
UL 198E Class R Fuses  
UL 977 Fused Power Circuit Devices

1.3 SUBMITTALS

A. General: Submit the following in accordance with the General- and Supplementary-Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements".

B. Shop Drawings: Include enclosure dimensions, type, electrical ratings, fuse provision, installation instructions, and nameplate nomenclature.

- C. Product Data: Submit for each type of product specified.
- D. Operating, Maintenance, and Instructional Data: Manufacturers’ written operating, maintenance, and installation instructions, including directions for storage and protection, handling, examination, and preparation.
  - 1. In addition, include copies of this data in Operating and Maintenance Manuals submitted, see Section 260501.
- E. Samples: Provide samples upon specific request.
- F. Certificates: Labels of UL listing, fixed to each item of material.

1.4 QUALITY ASSURANCE

- A. Qualifications of Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
- B. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- C. NEMA and UL Compliance: Products shall comply with applicable requirements of NEMA and UL standards. Provide products and components listed and labeled by UL.
- D. NECA Installation Standards: Perform work in accordance with NECA "Standard of Installation".
- E. Source Quality Control: Quality control testing shall meet applicable Underwriters' Laboratories Inc. Standards.

1.5 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store, protect, and handle products to site in accordance with the General- and Supplementary Conditions, Division 1 Specification Sections, and Section 260501, "General Electrical Requirements".
- B. Store and protect product in accordance with manufacturer’s instructions, and in a manner to prevent damage from the elements, personnel, equipment, and moisture.

1.6 PROJECT CONDITIONS OR SITE CONDITIONS

- A. Verify that field measurements are as shown prior to commencing the work.

1.7 COORDINATION

- A. For equipment furnished by the Owner, or under other Divisions: Size fuses in accordance with the National Electrical Code.

1.8 EXTRA MATERIALS

- A. Furnish 3 of each type and size of fuse installed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Alley Bradley
- B. Furnas
- C. Cutler-Hammer
- D. Siemens
- E. General Electric

2.2 MATERIALS

- A. For single phase motors under 2 horsepower Allen Bradley Bulletin 600 single phase manual switch, toggle type, with locking attachment, neon pilot light, heater elements sized per motor nameplate rating, NEMA 1 enclosure indoors, NEMA 4 enclosure exterior, in damp and wet locations, flush and surface as specified for outlet boxes.
- B. For other 250 volt equipment: NEMA Type HD, General Electric Type TH, fusible and non-fusible as required by NEC, with cover interlocks, with cabinets, with threaded hubs. Refer: Section 262816.
- C. Provide heavy duty type, quick-make, quick-break disconnects with cover interlocks.
- D. Provide NEMA Type 1 enclosure for dry locations, provide the proper enclosure for other locations as indicated.
- E. Provide motor rated toggle switches where indicated.
- F. Provide Bryant #3003 disconnect for 3 phase motors up to 5 horsepower.
- G. Provide fused disconnect for elevator drive motors.
- H. Provide rejection clips on disconnects where rejection type fuses are to be installed.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect building structure to which disconnects are to be secured for defects which affect the



execution and quality of work.

- B. Do not start work until defects are corrected.

### 3.2 PREPARATION

- A. Carefully measure and lay out exact locations maintaining working clearances required by the National Electrical Code.

### 3.3 INSTALLATION

- A. Provide disconnects where indicated and where required by the National Electrical Code.
- B. Install within sight of equipment served.
- C. Provide final connection to equipment served.
- D. Provide nameplate secured to cabinet with designation of equipment served, operating voltage, and circuit designation.
- E. The anchorage of motor and circuit disconnects required for elevator drives, emergency generator, emergency motor loads, fire pumps and emergency lighting shall be designed in accordance with Section 2313 of the Uniform Building Code for a lateral force based on a "Cp" value.

### 3.4 LABELING AND IDENTIFICATION

- A. Provide engraved plastic nameplates with 1/4 inch minimum height letters indicating:
  - 1. Circuit designation at branch overcurrent devices in distribution panelboards, switchboards and motor control center.
  - 2. Circuit designation of panel for device controlled on disconnects which are individually enclosed.
- B. Secure nameplates with at least two screws or rivets. Cementing and adhesive installation not acceptable.

END OF SECTION 262816

## SECTION 28 31 00 - FIRE ALARM SYSTEM

## PART 1 – GENERAL

## 1.1. SUMMARY

## A. Section Includes:

1. Fire alarm system shall consist of fire alarm control panel or networked nodes, of the same make and CSFM (California State Fire Marshall) listed for the application.
2. Labor, equipment, materials, connections, testing, and performance of operations in the installation of fire alarm system.

## B. Related Requirements:

1. Division 01 General Requirements.
2. Section 26 0501: General Electrical Requirements.
3. Section 26 0519: Low Voltage Electrical Power Conductors and Cable.
4. Section 26 0526: Grounding and Bonding for Electrical Systems.
5. Section 26 0529: Hangers and Supports for Electrical Systems
6. Section 26 0533: Raceways & Boxes for Electrical Systems

## 1.2. SYSTEM REQUIREMENTS

## A. Fire detection system shall continually supervise and monitor the following initiating, signaling, and monitoring circuits:

1. Manual fire-pull stations.
2. Smoke and heat detectors, duct detectors, including those installed under other sections.
3. Fire sprinkler flow and tamper switches. In existing installations also include PIV tamper switches.
4. Alarm signaling circuits including alarm bells, horns and visual alarm units.
5. Annunciators.
6. Power supplies and batteries.
7. Interconnection with Central and Autonomous Public Address systems, telephone network system, Clock System-Classroom or Program schedule change, HVAC system where applicable, kitchen fire suppression system, Theatrical and House Lighting, and elevator equipment for control of recall function and elevator circuit breaker shunt trip.

## B. System controls shall be UL listed for power limited applications in accordance with California Electrical Code.

## C. The fire alarm devices and equipment shall be listed for installation for the fire alarm control panel to which they are being connected.

## D. Complete installation shall conform to the 2016 version of NFPA 72, California Fire Code, California Building Code (CBC), and California Electrical Code (CEC) as approved by DSA on stamped drawings.

- E. System labels and devices programming addresses shall be based on final signage and building labeling submittals. For existing facilities contractor shall obtain from Owner Authorized Representative a copy of the current site layout and building labeling designations.
- F. Speaker circuits may be controlled by NAC outputs built into the amplifiers, which shall function as addressable points on the Digital Audio Loop.
- G. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone which ever is greater.
- H. Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.
- I. NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.
- J. Two-way emergency telephone communication circuits shall be supervised for open and short circuit conditions.
- K. Speaker circuits shall be arranged such that there is a minimum of one speaker circuit per smoke zone.
- L. Speaker circuits shall be electrically supervised for open and short circuit conditions. If a short circuit exists on a speaker circuit, it shall not be possible to activate that circuit.
- M. Audio amplifiers and tone generating equipment shall be electrically supervised for abnormal conditions. Digital amplifiers shall provide built-in speaker circuits, field configurable as four Class B (Style Y), or two Class A (Style Z) circuits.
- N. Digital amplifiers shall be capable of storing up to two minutes of digitally recorded audio messages and tones. The digital amplifiers shall also be capable of supervising the connection to the associated digital message generator, and upon loss of that connection shall be capable of one of the following system responses:
  - 1. The digital amplifier shall automatically broadcast the stored audio message.
  - 2. The digital amplifier shall switch to a mode where a local bus input on the digital amplifier will accept an input to initiate a broadcast of the stored message. This bus input shall be connected to a NAC on a local FACP for the purpose of providing an alternate means of initiating an emergency message during a communication fault condition.
  - 3. Speaker circuits shall be either 25 VRMS or 70VRMS. Speaker circuits shall have 20% space capacity for future expansion or increased power output requirements.
  - 4. Two-way emergency telephone (Fire Fighter Telephone) communication shall be supported between the Audio Command Center and up to seven (7) remote Fire Fighter's Telephone locations simultaneously on a telephone riser.
  - 5. Means shall be provided to connect FFT voice communications to the speaker circuits in order to allow voice paging over the speaker circuit from a telephone handset.
  - 6. The digital audio message generator shall be of reliable, non-moving parts, and support the digital storage of up to 32 minutes of tones and emergency messages, shall support programming options to string audio segments together to create up to 1000 messages, or to loop messages and parts of messages to repeat for pre-determined cycles or indefinitely.

### 1.3. CERTIFICATION

- A. Certification: Installation of fire alarm system shall not begin until Shop Drawings, including State Fire Marshal listing numbers of fire alarm components, are submitted and reviewed by the Architect. Written certification by fire alarm equipment distributor or manufacturer shall be submitted to the Architect stating that system and its component parts are as approved and listed by the State Fire Marshal, and that the design conforms to requirements set forth in CBC.

1.4. PERFORMANCE

- A. System shall be fully programmable, configurable, and expandable in the field without special tools or PROM programmers and shall not require replacement of memory ICs. Installer shall provide a CD of system installed software, site specific system programming and information and tools required to re-program or modify the system.

1.5. SYSTEM FUNCTIONAL OPERATION

- A. When a fire alarm condition is detected by one of the system alarm initiating devices, the following functions shall occur:

- 1. System alarm LED shall flash.
- 2. Local sounding device in panel shall be activated.
- 3. The LCD display shall indicate type of device, custom label location label and point status alarm condition.
- 4. Appropriate change of status message shall be transmitted to remote annunciator(s).
- 5. Automatic programs assigned to alarm point shall be executed and associated indicating devices and relays activated.
- 6. In the event of a fire alarm control panel activation, manual and automatic electronic tone or electromechanical bell class passing signals shall be disabled.
- 7. In the event of a fire alarm condition the Central and Autonomous Public Address System shall be overridden.
- 8. UDACT (Universal Digital Alarm Communicator Transmitter) shall activate.
- 9. Provide necessary hardware and labor for a complete and tested interfacing of the fire alarm system with the lighting controls systems in Auditoriums, Multi-Purpose rooms, and Gymnasiums; lighting in these areas shall be brought to full brightness in the event of a fire alarm.

- B. Trouble and Supervisory Conditions.

- 1. When any trouble condition is detected the following functions shall occur:
  - a. System trouble LED shall flash.
  - b. Local sounding device in panel shall be activated.
  - c. The LCD display shall indicate the type of trouble and custom label location associated with the trouble condition and its location. Unacknowledged alarm messages shall have priority over trouble messages. If such an alarm is displayed, then trouble messages shall not be displayed.
  - d. Appropriate message shall be transmitted to remote annunciators.
  - e. UDACT shall activate.
- 2. When any supervisory condition occurs such as a sprinkler valve tamper, the following function shall occur:
  - a. System supervisory LED shall flash.
  - b. Local sounding device in panel shall be activated.
  - c. Appropriate message shall be transmitted to remote annunciators.
  - d. UDACT shall activate.

3. Activation of control panel ACKNOWLEDGE switch in response to a single new alarm, trouble or supervisory condition shall silence panel sounding device and change system alarm, trouble, or supervisory LED from flashing to steady-ON. If additional new alarm, trouble, or supervisory conditions exist in the system; activation of this switch shall advance display to next alarm, trouble, or supervisory condition that exists, and shall not silence local audible device or change LED to steady until new conditions have been so acknowledged. New alarm conditions shall always be displayed before new trouble conditions. Occurrence of a new alarm, trouble, or supervisory condition shall cause panel to resound, and sequences as described above, shall repeat.
4. Activation of the signal silence switch shall cause appropriate notification (indicating) appliances and relays to return to normal condition. Selection of notification appliance circuits and relays silenced by this switch shall be fully programmable.
5. Activation of system reset switch shall cause electronically latched initiating devices or zones, as well as associated output devices and circuits, to return to normal condition after sixty seconds of alarm. If alarm conditions exist in system after system reset switch activation, system shall then re-sound alarm conditions as indicated hereafter.
6. Activation of lamp test switch shall turn on LED indicators, LCD display, and local sounding device in panel, and then return to previous condition.
7. Fire alarm indicating appliances may be silenced or extinguished, after one minute, by operating signal silence switch at the FACP or by use of key supervised alarm silence switch at remote annunciators. A subsequent zone alarm shall reactivate signals. Audible indicating appliances shall be automatically silenced after no less than five nor more than ten minutes of operation. Visual indicating appliances shall be extinguished at system reset, or automatically after no less than five nor more than ten minutes of operation. Fire sprinkler flow alarm bells shall not silence until the contacts in the fire sprinkler flow switch return to the normal non-alarm state. Appropriate signage must be installed on or next to the sprinkler alarm bell.
8. Elevator lobby, machine room and hoistway smoke detectors shall, in addition to operations listed above, cause elevator cars to be recalled as follows:
  - a. Elevator cars shall be recalled to main level of egress through the use of a primary recall interface relay.
  - b. Elevator cars shall be recalled to predetermine alternate level if main lobby smoke detector is activated.
  - c. Fire Fighter's hat light indicator in elevators shall provide visual warning when elevator lobby, machine room, and hoistway smoke detectors are activated.
9. System's circuits including but not limited to initiation, indicating, and equipment interfacing shall be monitored for open or short circuit and ground fault conditions, these conditions shall be indicated on the Fire Alarm Control Panel and Annunciator displays while remaining circuits continue to operate normally.
10. Notification appliance circuits shall be silenceable for testing purposes by authorized persons. Protected pass-codes, keys, or another secure method that does not require entering into the system programming shall be used.

#### 1.6. POWER REQUIREMENTS

- A. The fire alarm control panel and remote power supply shall receive 120 VAC power, 60 Hz, through a dedicated 20 amps circuit. Circuit breaker protection for the dedicated fire alarm power circuits shall be equipped with a handle lock-on device; the breaker handle shall be colored red and labeled "FIRE ALARM". Clearly label the Electrical panel name, location and circuit number on the inside of the fire alarm control panel and remote power supplies using a p-touch style labeling system. Transient voltage surge suppression shall be provided at the 120VAC input terminal.
- B. System shall be provided with sufficient battery capacity to operate entire system upon loss of normal 120 VAC power, in a normal quiescent mode, for a period of 24 hours with five minutes of alarm indication at end of this period. System shall automatically transfer to standby batteries upon power failure. Battery charging and recharging operations shall be automatic. Batteries, once discharged, shall recharge at a rate to provide a minimum of 70 percent capacity in 12 hours.
- C. Circuits requiring system operating power shall be 24 VDC and shall be individually protected at control panel.

### 1.7. SUBMITTALS

- A. Provide in accordance with Division 01.
- B. Component Plan Submittal: Availability and listing for its application shall be verified for system components before presentation of the submittal. Include the following information and details as applicable:
  - 1. Installer name, address, telephone number.
  - 2. List of system components, equipment and devices, including manufacturer model numbers, quantity and California State Fire Marshal listing numbers, mounting heights, and symbols per LBUSD symbol list.
  - 3. Copies of manufacturer specification sheets for equipment and devices indicated. Highlight or identify the specific components on Catalog cut sheets.
  - 4. Voltage Drop Calculations: Include the following information for the worst case:
    - a. Point-to-point or Ohms law calculations.
    - b. Zone used in calculations.
    - c. Voltage drop percent. Voltage drop shall not exceed manufacturer's requirements. If voltage drop exceeds ten percent, indicate manufacturer listed operating voltage ranges for equipment and devices.
  - 5. Battery types, amp hours, and load calculations including the following:
    - a. Normal operation: 100 percent of applicable devices for 24 hours to equal control panel amps plus list of amps per device that draw power from the panel during standby power condition including, but not limited to, zone modules, detectors and devices as identified.
    - b. Alarm condition: 100 percent of applicable devices for five minutes to equal control panel amps plus list of amps per device that draw power from panel during alarm condition including, but not limited to, the following:
      - 1) Zone modules.
      - 2) Signal modules.
      - 3) Detectors.

- 4) Signal devices.
  - 5) Annunciator.
  - 6) Other devices as identified.
  - c. Normal operation plus alarm operation load calculation shall include total amp hours required and total amp hours provided.
  - d. Provide one copy of testing procedures.
  - e. Fire alarm system batteries shall be stamped with the date of manufacture, minimum 12 months prior to installation, and include the name of the technician installing the equipment and the date installed. In addition, the company's name and contact information (address, phone number and general email) who installed the system shall be included.
- C. Shop Drawings: Provide Shop Drawings, in the same size as the design Drawings, include the following:
1. Provide drawing scale, elevations of system enclosures, and actual layout of the Fire Alarm Control Panel, power supply, annunciator, and main system components.
  2. Site Plan indicating PIV and related fire sprinkler system devices and equipment to be monitored or supervised; such as water flow valves, and main equipment such as control panels, power supplies, annunciators, and components such as outdoor wall-mounted horns, sprinkler bells, pull boxes, underground pull boxes, wiring routes on buildings exterior and underground locations. In each conduit or raceway run indicate conduit sizes, and quantities and type of wires.
  3. In existing facilities make a distinction between existing and new installation.
  4. Complete battery calculations, and voltage drop calculation shall be included; these calculations shall be based on the devices maximum UL current rating.
  5. One line drawing for the entire system network indicating system components and wiring. The one line diagram shall show but not be limited to panel to panel interconnections, conductor gauge and quantity, conduit size and type (designation) and specific function.
  6. System panel one-line drawings indicating the quantity and type (designation) of conductors entering and exiting the fire alarm terminal cabinet in each building (enclosure) for initiating, notification, or other command control functions required for complete system operation:
    - a. Individual floor or building plan view drawings indicating device locations including end of line resistors "EOLR" in accordance with the legend provided.
    - b. Individual point addresses for initiation and notification devices.
    - c. Device "typical" wiring diagrams. These drawings shall indicate specific termination details for peripheral equipment and interface devices.
  7. Provide interfacing with equipment furnished by others including voltages, and other required coordination items. Refer to 3.01-B.
  8. Each of the pictorial diagrams included shall appear identical to the products they are intended to depict, in order to speed installation of the system, and to enhance the accuracy of the installation Work. Typical wiring diagrams or catalog sheets are not permitted.
  9. Background Drawings with device locations of DSA approved drawings are available in electronic format and may be obtained from the Owner Authorized Representative (OAR). Contractor is solely responsible for the accuracy and completeness of shop

drawings. Buildings that are not part of the contract shall be clearly identified “NOT IN CONTRACT”. Shop Drawings shall be prepared in the latest version of AutoCAD with three – CD ROM electronic copies submitted along with full sized Shop Drawings.

10. Other installation and coordination drawings specifically related to this section shall be included as follows:
    - a. Size A (8 ½ by 11) and size B (11 by 17) shall be bound into the manual.
    - b. Larger drawings shall be folded and inserted into transparent envelopes and bound into the manual.
  11. Installation and coordination drawings for items in other sections shall be included with submittal of Shop Drawings. Submit blue line copies and one reproducible copy of installation and coordination drawings.
  12. Samples: Provide Samples of material and equipment as required by the Architect. If Samples are requested, they shall be submitted within ten days from date of request.
  - D. In addition to the above requirements, provide submittals to meet any additional requirements of DSA.
  - E. Submittal of Equivalent Systems:
    1. In addition to the submittal requirements of this section, if an equivalent system listed in Section 2.01A is submitted in lieu of the designed system shown on DSA approved drawings, the Contractor shall also submit a letter stating that the system is equivalent, and that device locations and quantities of devices are unchanged. Attached to this letter shall be a copy of the revised equipment schedule with corresponding CSFM numbers and a cut sheet for each item.
  - F. Modifications or additions to existing fire alarm systems shall be compatible and of the same manufacturer as the existing system. Contractor shall be solely responsible for engineering, plan check and any fees resulting from an installation that deviates from this requirement.
  - G. Prior to Substantial Completion submit to the Architect or Engineer of Record and to Owner Authorized Representative a complete updated set of the Shop Drawings showing changes made to the Fire Alarm System during construction. These drawings will become the System As-Built Drawing set for the Fire Alarm System Owner’s Manual.
    1. Records of all system inspections, tests and maintenance required by the referenced standards shall be maintained on the premises for a minimum of three years and shall be copied to the *fire code official* upon request. (2016 CFC 901.6.2 Records, including requirements of CCR Title 19, Division 1, Sections 904.1(b), 904.2(c) and 904.2(j).)
    2. Initial records shall include the name of the installation contractor, type of components installed, manufacturer of the components, location and number of components installed per floor. Records shall also include the manufacturers’ operation and maintenance instruction manuals. Such records shall be maintained on the premises. (2016 CFC 901.6.2.1)
- 1.8. QUALITY ASSURANCE
- A. Installer shall have successfully completed at least five projects of equal scope in the past five years, and have been in business of furnishing and installing fire alarm systems of this type for at least five years.
  - B. Installer shall be a factory authorized distributor and service provider for the brand of equipment offered and shall provide documentation to the Architect upon request.
  - C. Installer shall maintain a fully equipped service organization capable of furnishing repair service to the equipment and shall maintain a spare set of major parts for the system at all times.



- D. Installer shall furnish a letter from manufacturer of equipment certifying equipment has been installed according to factory standards and that system is operating properly.
- E. Certifications: Installer shall submit certification from the equipment manufacturer indicating that installer is an authorized representative of the equipment manufacturer and is trained on network applications.
- F. Materials and equipment installed shall be new.
- G. Equipment in this specification shall be furnished and installed by the Authorized Factory Distributor of the equipment. Furnish a letter from the manufacturer of major equipment, which certifies that the installer is an authorized distributor and that the equipment has been installed according to factory intended practices. Furnish a written guarantee from the manufacturer that they will have a service representative assigned to this area for the life of the equipment.
- H. Installer shall be Underwriters Laboratory (UL) listed company under the UUJS classification, and shall certify that the installation has been made in accordance with UL requirements.
- I. The fire alarm contractor shall have a NICET II Certified Technician on staff in their facility directly involved with this project to ensure technical expertise to this project and adherence with these specifications.
- J. Contractor or Installer's Electricians and fire and life safety technicians shall be certified in accordance with Labor Code sections 3099, and 3099.2, and section 209.0 of the California Code of Regulations.
- K. System startup and testing shall be performed under the direct observation of the Project Inspector and OAR. Provide a legible half size reproduction of the original completed fire alarm red-line drawings (this copy will be retained by the Owner), an accurate copy of the fire alarm system points list, and a copy of the construction drawings on CD in AutoCad format.
- L. At the time of installation the most current software package available shall be provided.
- M. Provide at the time of Owner Acceptance of the installation, equipment, and updated software which is to include the appropriate operating system, pass-codes, electronic keys and program disks, manuals and cables employed in the installation of the system. These components shall be delivered to the OAR.
- N. Provide a backup copy of the most current software revision, in disk format. This copy shall be delivered to the OAR
- O. A software license agreement shall be made available for the responsible Owner representative to sign at the time of training.

#### 1.9. WARRANTY

- A. The Fire Alarm Equipment Manufacturer shall provide a five year material warranty. Installer shall provide a three year labor warranty.
- B. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer for a period of five years after expiration of the warranty.

### PART 2.0 PRODUCTS

#### 2.1 MAIN FIRE ALARM CONTROL PANEL OR NETWORK NODE:

- A. Main FACP or network node shall be a NOTIFIERJohnson ControlsHoneywell Model NFS2-3030IFC2-3030XLS3000 and shall contain a microprocessor based Central Processing Unit (CPU) and power supply. The CPU shall communicate with and control the following types of

equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.

- B. In conjunction with intelligent Loop Control Modules and Loop Expander Modules, the main FACP shall perform the following functions:
1. Supervise and monitor all intelligent addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
  2. Supervise all initiating signaling and notification circuits throughout the facility by way of connection to addressable monitor and control modules.
  3. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed. In the event of CPU failure, all SLC loop modules shall fallback to degrade mode. Such degrade mode shall treat the corresponding SLC loop control modules and associated detection devices as conventional two-wire operation. Any activation of a detector in this mode shall automatically activate associated Notification Appliance Circuits.

## 2.2 System Capacity and General Operation

- A. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels / nodes per network.
- B. The control panel shall be capable of expansion via up to 10 SLC loops. Each module shall support up to 318 analog/addressable devices for a maximum system capacity of 3180 points. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit 640-character liquid crystal display, individual, color coded system status LEDs, and a QWERTY style alphanumeric keypad for the field programming and control of the fire alarm system. Said LCD shall also support graphic bit maps capable of displaying the company name and logo of installation company.
- C. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel.
- D. The FACP shall be able to provide the following software and hardware features:
1. Pre-signal and Positive Alarm Sequence: The system shall provide means to cause alarm signals to only sound in specific areas with a delay of the alarm from 60 to up to 180 seconds after start of alarm processing. In addition, a Positive Alarm Sequence selection shall be available that allows a 15-second time period for acknowledging an alarm signal from a fire detection/initiating device. If the alarm is not acknowledged within 15 seconds, all local and remote outputs shall automatically activate immediately.
  2. Smoke Detector Pre-alarm Indication at Control Panel: To obtain early warning of incipient or potential fire conditions, the system shall support a programmable option to determine system response to real-time detector sensing values above the programmed setting. Two levels of Pre-alarm indication shall be available at the control panel: alert and action.
  3. Alert: It shall be possible to set individual smoke detectors for pre-programmed pre-alarm

- thresholds. If the individual threshold is reached, the pre-alarm condition shall be activated.
4. Action: If programmed for Action and the detector reaches a level exceeding the pre-programmed level, the control panel shall indicate an action condition. Sounder bases installed with either heat or smoke detectors shall automatically activate on action Pre-Alarm level, with general evacuation on Alarm level.
  5. The system shall support a detector response time to meet world annunciation requirements of less than 3 seconds.
  6. Device Blink Control: Means shall be provided to turn off detector/module LED strobes for special areas.
  7. NFPA 72 Smoke Detector Sensitivity Test: The system shall provide an automatic smoke detector test function that meets the sensitivity testing requirements of NFPA 72.
  8. Programmable Trouble Reminder: The system shall provide means to automatically initiate a reminder that troubles exist in the system. The reminder will appear on the system display and (if enabled) will sound a piezo alarm.
  9. On-line or Off-line programming: The system shall provide means to allow panel programming either through an off-line software utility program away from the panel or while connected and on-line. The system shall also support upload and download of programmed database and panel executive system program to a Personal Computer/laptop. A single change to one CPU database shall not require a database download to other CPUs.
  10. History Events: The panel shall maintain a history file of the last 4000 events, each with a time and date stamp. History events shall include all alarms, troubles, operator actions, and programming entries. The control panels shall also maintain a 1000 event Alarm History buffer, which consists of the 1000 most recent alarm events from the 4000 event history file.
  11. Smoke Control Modes: The system shall provide means to perform FSCS mode Smoke Control to meet NFPA-92A and 90B and HVAC mode to meet NFPA 90A.
  12. The system shall provide means for all SLC devices on any SLC loop to be auto programmed into the system by specific address. The system shall recognize specific device type ID's and associate that ID with the corresponding address of the device.
  13. Passwords and Users: The system shall support two password levels, master and user. Up to 9 user passwords shall be available, each of which may be assigned access to the programming change menus, the alter status menus, or both. Only the master password shall allow access to password change screens.
  14. Block Acknowledge: The system shall support a block Acknowledge for Trouble Conditions
  15. Sensitivity Adjust: The system shall provide Automatic Detector Sensitivity Adjust based on Occupancy schedules including a Holiday list of up to 15 days.
  16. Environmental Drift Control: The system shall provide means for setting Environmental Drift Compensation by device. When a detector accumulates dust in the chamber and reaches an unacceptable level but yet still below the allowed limit, the control panel shall indicate a maintenance alert warning. When the detector accumulates dust in the chamber above the allowed limit, the control panel shall indicate a maintenance urgent warning.
  17. Custom Action Messages: The system shall provide means to enter up to 100 custom action messages of up to 160 characters each. It shall be possible to assign any of the 100 messages to any point.
  18. Local Mode: If communication is lost to the central processor the system shall provide

- added survivability through the intelligent loop control modules. Inputs from devices connected to the SLC and loop control modules shall activate outputs on the same loop when the inputs and outputs have been set with point programming to participate in local mode or when the type codes are of the same type: that is, an input with a fire alarm type code shall activate an output with a fire alarm type code.
19. Read status preview - enabled and disabled points: Prior to re-enabling points, the system shall inform the user that a disabled device is in the alarm state. This shall provide notice that the device must be reset before the device is enabled thereby avoiding activation of the notification circuits.
  20. Custom Graphics: When fitted with an LCD display, the panel shall permit uploading of a custom bit-mapped graphic to the display screen.
  21. Multi-Detector and Cooperating Detectors: The system shall provide means to link one detector with up to two detectors at other addresses on the same loop in cooperative multi-detector sensing. There shall be no requirement for sequential addresses on the detectors and the alarm event shall be a result of all cooperating detectors chamber readings.
  22. ACTIVE EVENT: The system shall provide a Type ID called FIRE CONTROL for purposes of air-handling shutdown, which shall be intended to override normal operating automatic functions. Activation of a FIRE CONTROL point shall cause the control panel to (1) initiate the monitor module Control-by-Event, (2) send a message to the panel display, history buffer, installed printer and annunciators, (3) shall not light an indicator at the control panel, (4) Shall display ACTIVE on the LCD as well a display a FIRE CONTROL Type Code and other information specific to the device.
  23. NON-FIRE Alarm Module Reporting: A point with a type ID of NON-FIRE shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation nor shall it display a message at the panel LDC. Activation of a NON-FIRE point shall activate control by event logic but shall not cause any indication on the control panel.
  24. Mass Notification Override: The system shall be UL 2572 listed for Mass Notification and shall be capable, based on the Risk Analysis, of being programmed so that Mass Notification/Emergency Communications events take precedence over fire alarm events.
  25. Security Monitor Points: The system shall provide means to monitor any point as a type security.
  26. One-Man Walk Test: The system shall provide both a basic and advanced walk test for testing the entire fire alarm system. The basic walk test shall allow a single operator to run audible tests on the panel. All logic equation automation shall be suspended during the test and while annunciator's can be enabled for the test, all shall default to the disabled state. During an advanced walk test, field-supplied output point programming will react to input stimuli such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch the input. The advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device and wiring operation/verification.
  27. Control By Event Functions: CBE software functions shall provide means to program a variety of output responses based on various initiating events. The control panel shall operate CBE through lists of zones. A zone shall become listed when it is added to a point's zone map through point programming. Each input point such as detector, monitor module or panel circuit module shall support listing of up to 10 zones into its programmed zone map.
  28. Permitted zone types shall be general zone, releasing zone and special zone. Each output

- point (control module, panel circuit module) can support a list of up to 10 zones including general zone, logic zone, releasing zone and trouble zone. It shall be possible for output points to be assigned to list general alarm. Non-Alarm or Supervisory points shall not activate the general alarm zone.
29. 1000 General Zones: The system shall support up to 1000 general purpose software zones for linking inputs to outputs. When an input device activates, any general zone programmed into that device's zone map will be active and any output device that has an active general zone in its map will be active. It shall also be possible to use general zone as arguments in logic equations.
  30. 1000 Logic Equations: The system shall support up to 1000 logic equations for AND, OR, NOT, ONLY1, ANYX, XZONE or RANGE operators that allow conditional I/O linking. When any logic equation becomes true, all output points mapped to the logic zone shall activate.
  31. 100 trouble equations per device: The system shall provide support for up to 100 trouble equations for each device, which shall permit programming parameters to be altered, based on specific fault conditions. If the trouble equation becomes true, all output points mapped to the trouble zone shall activate.
  32. Control-By-Time: A time based logic function shall be available to delay an action for a specific period of time based upon a logic input with tracking feature. A latched version shall also be available. Another version of this shall permit activation on specific days of the week or year with ability to set and restore based on a 24 hour time schedule on any day of the week or year.
  33. Multiple agent releasing zones: The system shall support up to 10 releasing zones to protect against 10 independent hazards. Releasing zones shall provide up to three cross-zone and four abort options to satisfy any local jurisdiction requirements.
  34. Alarm Verification, by device, with timer and tally: The system shall provide a user-defined global software timer function that can be set for a specific detector. The timer function shall delay an alarm signal for a user-specified time period and the control panel shall ignore the alarm verification timer if another alarm is detected during the verification period. It shall also be possible to set a maximum verification count between 0 and 20 with the "0" setting producing no alarm verification. When the counter exceeds the threshold value entered, a trouble shall be generated to the panel.

E. Network Communication

1. The FACP shall be capable of communicating on Noti-Fire-Net over a Local Area Network (LAN) or Wide Area Network (WAN) utilizing a peer-to-peer, inherently regenerative communication format and protocol. The network shall support communication speed up to 100 Mb and support up to 200 panels/nodes per network.

F. Central Processing Unit

1. The Central Processing Unit shall contain and execute all control-by-event (including Boolean functions including but not limited to AND, OR, NOT, ANYx, and CROSSZONE) programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost with system primary and secondary power failure.
2. The Central Processing Unit shall also provide a real-time clock for time annotation, to

the second, of all system events. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.

3. The CPU shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems that require the use of external programmers or change of EPROMs are not acceptable.
4. The CPU shall provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals.
5. The CPU shall provide two EIA-485 ports for the serial connection to annunciation and control subsystem components.
6. The EIA-232 serial output circuit shall be optically isolated to assure protection from earth ground.

#### G. Display

1. The system display shall provide a 640-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide eleven Light-Emitting-Diodes (LEDs) that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, OTHER EVENT, SIGNALS SILENCED, POINT DISABLED, CONTROLS ACTIVE, and CPU FAILURE.
2. The system display shall provide a keypad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels with up to ten (one Master and nine User) passwords shall be accessible through the display interface assembly to prevent unauthorized system control or programming.

#### H. Loop (Signaling Line Circuit) Control Module:

1. The Loop Control Module shall monitor and control a minimum of 318 intelligent addressable devices. This includes 159 intelligent detectors (Ionization, Photoelectric, or Thermal) and 159 monitor or control modules.
2. The Loop Control Module shall contain its own microprocessor and shall be capable of operating in a local/degrade mode (any addressable device input shall be capable of activating any or all addressable device outputs) in the unlikely event of a failure in the main CPU.
3. Each Loop shall be capable of operating as a NFPA Style 4 (Class B) circuit.
4. The SLC interface board shall receive analog or digital information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular device. Each SLC Loop shall be isolated and equipped to annunciate an Earth Fault condition. The SLC interface board software shall include software to automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information may also be used for automatic detector testing and the automatic determination of detector maintenance requirements.

#### I. Digital Voice Command Center

1. The Digital Voice Command Center located with the FACP, shall contain all equipment required for all audio control, emergency telephone system control, signaling and

supervisory functions. This shall include speaker zone indication and control, telephone circuit indication and control, digital voice units, microphone and main telephone handset.

2. Function: The Voice Command Center equipment shall perform the following functions:
  - a. Operate as a supervised multi-channel emergency voice communication system.  
Operate as a two-way emergency telephone system control center.
  - b. Audibly and visually annunciate the active or trouble condition of every speaker circuit and emergency telephone circuit.
  - c. Audibly and visually annunciate any trouble condition for digital tone and voice units required for normal operation of the system.
  - d. Provide all-call Emergency Paging activities through activation of a single control switch.
  - e. As required, provide vectored paging control to specific audio zones via dedicated control switches.
  - f. Provide a factory recorded "library" of voice messages and tones in standard WAV. File format, which may be edited and saved on a PC running a current Windows® operating system.
  - g. Provide a software utility capable of off-line programming for the DVC operation and the audio message files. This utility shall support the creation of new programs as well as editing and saving existing program files. Uploading or downloading the DVC shall not inhibit the emergency operation of other nodes on the fire alarm network.
  - h. Support an optional mode of operation with four analog audio outputs capable of being used with UL 864 fire-listed analog audio amplifiers and SLC controlled switching.
  - i. The Digital Voice Command shall be modular in construction, and shall be capable of being field programmable without requiring the return of any components to the manufacturer and without requiring use of any external computers or other programming equipment.
  - j. The Digital Voice Command and associated equipment shall be protected against unusually high voltage surges or line transients.

J. Power Supply:

1. The Main Power Supply shall operate on 120/240 VAC, 50/60 Hz, and shall provide all necessary power for the FACP.
2. The Main Power Supply shall provide the required power to the CPU using a switching 24 VDC regulator and shall incorporate a battery charger for 24 hours of standby power using dual-rate charging techniques for fast battery recharge.
3. The Main Power Supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge. The supply shall be capable of charging batteries ranging in capacity from 7-200 amp-hours within a 48-hour period.
4. The Main Power Supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
5. The Main Power Supply shall be power-limited per UL864 requirements.
6. The Main Power Supply shall communicate power supply, line voltage, battery status and charger status to the local LCD display. Any abnormal condition shall be annunciated and logged to the system alarm history log.

7. Addressable Charger Power Supply: The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24 VDC power. . NOTIFIER model # ACPS-610
8. The addressable power supply for the fire system shall provide up to a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 10.0 amps of 24 volt DC general power. The power supply shall have an additional 0.5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 12 - 200 amp hour batteries.
9. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as Class "A" or Class "B" circuits. All circuits shall be power-limited per UL 864 requirements.
10. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
11. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
12. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire.
13. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.
14. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of zero, two, eight or sixteen hours shall be programmable.
15. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be programmable.
16. The addressable power supply mounts in either the FACP back box or its own dedicated surface mounted back box with cover.
17. Each of the power supply's four output circuits shall be programmed- for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.
18. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of an end-of-line resistor. When the power supply's output circuit is selected as General 24 VDC power, the circuit shall be individually supervised when an end-of-line relay is used.
19. When selected for Notification Appliance Circuits, the output circuits shall be individually programmable for Steady, March Time, Dual Stage or Temporal.
20. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.
21. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.
22. An individual or multiple interfaced addressable power supplies shall have the option to



use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

K. Audio Amplifiers

1. The Audio Amplifiers will provide Audio Power () for distribution to speaker circuits.
2. Multiple audio amplifiers may be mounted in a single enclosure, either to supply incremental audio power, or to function as an automatically switched backup amplifier(s).
3. The audio amplifier shall include an integral power supply, and shall provide built-in LED indicators for the following conditions:
  - a. Earth Fault on DAP A (Digital Audio Port A)
  - b. Earth Fault on DAP B (Digital Audio Port B)
  - c. Audio Amplifier Failure Detected Trouble
  - d. Active Alarm Bus input
  - e. Audio Detected on Aux Input A
  - f. Audio Detected on Aux Input B
  - g. Audio Detected on Firefighter's Telephone Riser
  - h. Receiving Audio from digital audio riser
  - i. Short circuit on speaker circuit 1
  - j. Short circuit on speaker circuit 2
  - k. Short circuit on speaker circuit 3
  - l. Short circuit on speaker circuit 4
  - m. Data Transmitted on DAP A
  - n. Data Received on DAP A
  - o. Data Transmitted on DAP B
  - p. Data Received on DAP B
  - q. Board failure
  - r. Active fiber optic media connection on port A (fiber optic media applications)
  - s. Active fiber optic media connection on port B (fiber optic media applications)
  - t. Power supply Earth Fault
  - u. Power supply 5V present
  - v. Power supply conditions - Brownout, High Battery, Low Battery, Charger Trouble
4. The audio amplifier shall provide the following built-in controls:
  - a. Amplifier Address Selection Switches
  - b. Signal Silence of communication loss annunciation Reset
  - c. Level adjustment for background music
  - d. Enable/Disable for Earth Fault detection on DAP A
  - e. Enable/Disable for Earth Fault detection on DAP A
  - f. Switch for 2-wire/4-wire FFT riser
5. Adjustment of the correct audio level for the amplifier shall not require any special tools or test equipment.
6. Includes audio input and amplified output supervision, back up input, and automatic switch over function, (if primary amplifier should fail).
7. System shall be capable of backing up digital amplifiers.

8. One-to-one backup shall be provided by either a plug-in amplifier card or a designated backup amplifier of identical model as the primary amplifier.
9. One designated backup amplifier shall be capable of backing up multiple primary amplifiers mounted in the same or adjacent cabinets.
10. Multi-channel operation from a single amplifier shall be supported by the addition of an optional plug-in amplifier card.

L. Audio Message Generator (Prerecorded Voice)/Speaker Control:

1. Each initiating zone or intelligent device shall interface with an emergency voice communication system capable of transmitting a prerecorded voice message to all speakers in the building.
2. Actuation of any alarm initiating device shall cause a prerecorded message to sound over the speakers. The message shall be repeated four (4) times. Pre- and post-message tones shall be supported.
3. A built-in microphone shall be provided to allow paging through speaker circuits.
4. System paging from emergency telephone circuits shall be supported.
5. The audio message generator shall have the following indicators and controls to allow for proper operator understanding and control:
  - a. Lamp Test
  - b. Trouble
  - c. Off-Line Trouble
  - d. Microphone Trouble
  - e. Phone Trouble
  - f. Busy/Wait
  - g. Page Inhibited
  - h. Pre/Post Announcement Tone

M. Controls with associated LED Indicators:

1. Speaker Switches/Indicators
  - a. The speaker circuit control switches/indicators shall include visual indication of active and trouble status for each speaker circuit in the system.
  - b. The speaker circuit control panel shall include switches to manually activate or deactivate each speaker circuit in the system.
2. Emergency Two-Way Telephone Control Switches/Indicators
  - a. The emergency telephone circuit control panel shall include visual indication of active and trouble status for each telephone circuit in the system.
  - b. The telephone circuit control panel shall include switches to manually activate or deactivate each telephone circuit in the system.

N. Remote Transmissions:

1. Provide local energy or polarity reversal or trip circuits as required.
2. The system shall be capable of operating a polarity reversal or local energy or fire alarm

- transmitter for automatically transmitting fire information to the fire department.
  3. Provide capability and equipment for transmission of zone alarm and trouble signals to remote operator's terminals, system printers and annunciators.
  4. Transmitters shall be compatible with the systems and equipment they are connected to such as timing, operation and other required features.
- O. Field Programming
1. The system shall be programmable, configurable and expandable in the field without the need for special tools, laptop computers, or other electronic interface equipment. There shall be no firmware changes required to field modify the system time, point information, equations, or annunciator programming/information.
  2. All field defined programs shall be stored in non-volatile memory.
- P. Specific System Operations
1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
  2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 0 to 60 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
- Q. System Point Operations:
1. Any addressable device in the system shall have the capability to be enabled or disabled through the system keypad or video terminal.
  2. System output points shall be capable of being turned on or off from the system keypad or the video terminal.
  3. Point Read: The system shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:
    - a. Device Status.
    - b. Device Type.
    - c. Custom Device Label.
    - d. Software Zone Label.
    - e. Device Zone Assignments.
    - f. Analog Detector Sensitivity.
    - g. All Program Parameters.
  4. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 4000 system events. Each of these events will be stored, with time and date stamp, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be

manually reviewed; one event at a time, and the actual number of activations may also be displayed and or printed. History events shall include all alarms, troubles, operator actions, and programming entries.

5. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.
6. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
7. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular Intelligent Detector will be annunciated on the system display, and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
8. The system shall include the ability (programmable) to indicate a "pre-alarm" condition. This will be used to alert maintenance personal when a detector is at 80% of its alarm threshold in a 60 second period.

### 2.3 SYSTEM COMPONENTS:

#### A. Conventional Aspirating Detection

1. An optional air aspiration detection system shall be available.
2. The aspirating system shall support multiple sensitivity settings.
3. The aspirating system shall operate from 24 VDC.
4. The aspirating system shall provide alarm and trouble relays used to activate a fire alarm control panel.

#### B. Aspiration System Interface:

1. The system shall be capable of supporting Interface Modules for integrating Vesda Aspiration detectors into SLC loop of the fire alarm control panel. The Interface Module shall support up to 19 detectors, each SLC loop shall support one interface module.

#### C. High Level Aspiration System Interface:

1. The system shall be capable of supporting a High Level Interface for Vesda Aspirating Detection Systems. The interface shall support up to 100 detectors and allow the fire alarm network to monitor and control events on the aspiration system.

#### D. Portable Emergency Telephone Handset Jack

1. Portable emergency telephone handset jacks shall be flush mounted on stainless steel plates as indicated on plans. Handset jacks shall be approved for emergency telephone system application.
2. Insertion of a remote handset plug into a jack shall send a signal to the fire command center which shall audibly and visually indicate the on-line condition, and shall sound a ring indication in the handset.
3. The two-way emergency telephone system shall support a minimum of seven (7) handsets on line without degradation of the signal.

## E. Fixed Emergency Telephone Handset

1. The telephone cabinet shall be painted red and clearly labeled emergency telephone. The cabinets shall be located where shown on drawings.
2. The handset cradle shall have a switch connection such that lifting the handset off of the cradle shall send a signal to the fire command center which shall audibly and visually indicate its on-line (off-hook) condition.
3. The two-way emergency telephone system shall support a maximum of seven (7) handsets on line (off hook) without degradation of the signal.

## F. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station.

1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to two different telephone numbers.
3. The UDACT shall be capable of transmitting events in 4+2, SIA, and Contact ID.
4. Communication shall include vital system status such as:
  - a. Independent Zone (Alarm, trouble, non-alarm, supervisory)
  - b. Independent Addressable Device Status
  - c. AC (Mains) Power Loss
  - d. Low Battery and Earth Fault
  - e. System Off Normal
  - f. 12 and 24 Hour Test Signal
  - g. Abnormal Test Signal (per UL requirements)
  - h. EIA-485 Communications Failure
  - i. Phone Line Failure
5. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 3,064 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.
6. The UDACT shall be capable of being programmed with the same programming utility as the host FACP, and saved, edited and uploaded and downloaded using the utility. UDACT shall be capable of being programmed online or offline. The programming utility shall also support upgrading UDACT operating firmware.
7. The UDACT shall be capable of generating Central Station reports providing detailed programming information for each point along with the central station point address.
8. An IP or IP/GSM Communicator option shall be available to interface to the UDACT and be capable of transmitting signals over the internet/intranet or Cellular (GSM) network to

a compatible receiver.

G. Field Wiring Terminal Blocks

1. For ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks that are permanently fixed are not acceptable.

H. Printer

1. The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. The printer shall be enclosed in a separate cabinet suitable for placement on a desktop or table. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.
2. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.
3. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

I. Smoke Control Annunciator to be by Kirkland and controlled by BMS.

1. On/Auto/Off switches and status indicators (LEDS) shall be provided for monitoring and manual control of each fan, damper, HVAC control unit, stairwell pressurization fan, and smoke exhaust fan. To ensure compliance the units supplied shall meet the following UL categories: UUKL, PAZX, UDTZ, QVAX as well as the requirements of NFPA 90A, HVAC, and NFPA 92A & 92B, Smoke Control. The control System shall be field programmable for either 90A operation or 92A/B operation to allow for future use and system expansion.
2. The OFF LED shall be Yellow, the ON LED shall be green, the Trouble/Fault LED shall be Amber/Orange for each switch. The Trouble/Fault indicator shall indicate a trouble in the control and/or monitor points associated with that switch. In addition, each group of eight switches shall have two LEDS and one momentary switch which allow the following functions: An Amber LED to indicate an OFF-NORMAL switch position, in the ON or OFF position; A Green LED to indicate ALL AUTO switch position; A Local Acknowledge/Lamp Test momentary switch.
3. Each switch shall have the capability to monitor and control two addressable inputs and two addressable outputs. In all modes, the ON and OFF indicators shall continuously follow the device status not the switch position. Positive feedback shall be employed to verify correct operation of the device being controlled. Systems that indicate on/off/auto by physical switch position only are not acceptable.

4. All HVAC switches (i.e., limit switches, vane switches, etc.) shall be provided and installed by the HVAC contractor.
5. It shall be possible to meet the requirements mentioned above utilizing wall mounted custom graphic.

#### 2.4 Gateway & Webserver Options

- A. Common Alerting Protocol (CAP) Gateway: The system shall support an optional CAP Gateway (Common Alerting Protocol). The CAP Gateway translates fire system messages to industry standard CAP messages for integration with CAP-compliant clients. A CAP gateway shall be available from the fire alarm control panel manufacturer.
- B. LEDSIGN Gateway: The system shall support an optional and proprietary LEDSIGN Gateway to interface to LED signs that will automatically display emergency messages. The signs shall be capable of storing up to 100 messages that can be activated via system programming with the ability to be manually overridden. The Sign Gateway shall support up to 10 independent signs, each sign capable of playing an independent message. Multiple LEDSIGN Gateways can be used in network applications. An LEDSIGN gateway shall be available from the fire alarm control panel manufacturer.
- C. BACnet Interface Gateway: The system shall be capable of being interfaced with BACnet compliant clients. A BACnet interface supporting BACnet/IP communication shall be available from the fire alarm control panel manufacturer.
- D. MODbus Interface Gateway: The system shall be capable of being interfaced with MODbus compliant clients. A MODbus interface supporting MODbus/TCP communication shall be available from the fire alarm control panel manufacturer.
- E. Noti-Fire-Net Gateway: The system shall support an IP based gateway to enable the panel or local Noti-Fire-Net to be connected to an ONYXWorks workstation via the Internet or Intranet. This gateway shall also support the ability to integrate the system to an interactive firefighter's display. The Noti-Fire-Net Gateway shall be available from the fire alarm control panel manufacturer.
- F. Webserver: The system shall support a webserver allowing remote connection via the Internet or Intranet. Authorized users will have the ability to view panel/network history, event status and device properties. The webserver shall also support sending event information via email or text to up to 50 registered users, the webserver shall be available from the fire alarm control panel manufacturer.
- G. Web Portal Interface: The system shall be capable of being interfaced with a web portal to integrate with Inspection and Service Manager utilities. The web portal and inspection and service manager utilities shall be available from the fire alarm control panel manufacturer.

#### 2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

- A. Addressable Devices – General
  1. Addressable devices shall provide an address-setting means using rotary decimal

- switches. Addressable devices that require the address be programmed using a programming utility are not an allowable substitute.
2. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
  3. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
  4. Addressable devices, which use a binary-coded address setting method, such as a DIP-switch, are not an allowable substitute. Addressable devices that require the address be programmed using a special tool or programming utility are not an allowable substitute.
  5. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
  6. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
  7. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. The panel on a time-of-day basis shall automatically adjust sensitivity.
  8. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
  9. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications. The system shall also support an intelligent programmable sounder base, the programmable sounder base shall be capable of providing multiple tones based on programming and at a minimum be capable of providing a Temp-4 tone for CO (Carbon Monoxide) activation and a Temp-3 tone for fire activations and be capable of being synchronized with other programmable sounder bases and common area notification appliances; 85 DBA minimum.
  10. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
  11. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
  12. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
  13. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
  14. Addressable modules shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box. An optional surface mount Lexan enclosure shall be available.



- B. Addressable Manual Fire Alarm Box (manual station)
1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status; NOTIFIER model # NBG-12LX. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
  2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
  3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.
- C. Intelligent Photoelectric Smoke Detector: The intelligent photoelectric smoke detector shall be NOTIFIER model # FSP-851 and shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- D. Intelligent VIEW® Laser Photo Smoke Detector: The intelligent laser photo smoke detector shall be a spot type detector, NOTIFIER model # FSL-751, that incorporates an extremely bright laser diode and an integral lens that focuses the light beam to a very small volume near a receiving photo sensor. The scattering of smoke particles shall activate the photo sensor.
1. The laser detector shall have conductive plastic so that dust accumulation is reduced significantly.
  2. The intelligent laser photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.02 percent per foot.
  3. The laser detector shall not require expensive conduit, special fittings or PVC pipe.
  4. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.
  5. The laser photo detector shall not require other cleaning requirements than those listed in NFPA 72. Replacement, refurbishment or specialized cleaning of the detector head shall not be required.
  6. The laser photo detector shall include two bicolor LEDs that flash green in normal operation and turn on steady red in alarm.
- E. Intelligent Ionization Smoke Detector: The intelligent ionization smoke detector shall be NOTIFIER model # FSI-851 and shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.
- F. Intelligent Multi Criteria Acclimating Detector: The intelligent multi-criteria Acclimate® Plus™ detector shall be an addressable device, NOTIFIER model # FAPT-851, that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all

within a single sensing device.

1. The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).
  2. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.
- G. Intelligent Thermal Detectors: The intelligent thermal detectors shall be NOTIFIER FST- series addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. A high heat thermal detector rated at 190 degrees Fahrenheit shall also be available. The thermal detectors shall connect via two wires to the fire alarm control panel signaling line circuit.
- H. Intelligent Duct Smoke Detector: The smoke detector housing shall accommodate an intelligent photoelectric detector that provides continuous analog monitoring and alarm verification from the panel. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system. The Intelligent Duct Smoke Detector shall support the installation of addressable Photoelectric detector capable or being tested remotely. The Intelligent Duct Detector housing shall be model # DNR(W) and the remote test capable photoelectric smoke detector shall be NOTIFIER model # FSP-851R.
- I. IntelliQuad™ Advanced Multi-Criteria Intelligent Detector
1. Intelligent multi-criteria fire detector shall be a NOTIFIER model number FSC-851. Smoke detector shall be an addressable intelligent multi-criteria smoke detector. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical carbon monoxide (CO) sensor, a daylight-filtered infrared sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.
  2. The intelligent multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in an effort to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The product design shall be capable of selecting the appropriate sensitivity levels based on the environment type chosen by user in which it is installed (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes.
  3. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The device shall provide unique signals to indicate when 20% of the drift range is remaining, when 100% of drift range is used, and when there is a chamber fault to show unit requires

- maintenance.
4. The detector shall indicate CO trouble conditions including 6 months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self test failure, IR self test failure, and freeze warning.
  5. The detectors shall provide address-setting means on the detector head using rotary switches. Because of the possibility of installation error, systems that use binary jumpers or DIP switches to set the detector address are not acceptable. The detectors shall also store an internal identifying code that the control panel shall use to identify the type of detector. Systems that require a special programmer to set the detector address (including temporary connection at the panel) are labor intensive and not acceptable. Each detector occupies any one of at least 99 possible addresses on the signaling line circuit (SLC) loop. It responds to regular polls from the system and reports its type and status.
  6. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel. There are three test methods: functional magnet, smoke entry aerosol, or direct heat method.
  7. The detectors shall provide two LEDs to provide 360° visibility. The LEDs are placed into steady red illumination by the control panel indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED, sounder base, and / or relay base (optional accessories). The external remote alarm can be interconnected to other sounder or relay bases for activating all devices in a space via a single alarming unit.
  8. Two LEDs on the sensor are controlled by the panel to indicate sensor status. Coded signals, transmitted from the panel, can cause the LEDs to blink, latch on, or latch off. Refer to the control panel technical documentation for sensor LED status operation and expected delay to alarm.
  9. The detectors shall be ceiling-mount and shall be plug-in mounted into a twist-lock base. These detectors shall be constructed of off-white UV resistant polymer and shall be detachable from the mounting base to simplify installation, service and maintenance. Mounting base wiring connections shall be made by means of SEMS screws. The detector shall allow pre-wiring of the base and the head shall be a plug-in type. Mounting base shall be mounted on junction box which is at least 1.5 inches (3.81 cm) deep. Mounting base shall be available to mount to standard junction boxes. Suitable boxes include:
    - a. 4.0" (10.16 cm) square box with and without plaster ring.
    - b. 4.0" (10.16 cm) octagonal box.
    - c. 3.5" (8.89 cm) octagonal box.
    - d. Single-gang box.
  10. Meets Agency Standards
    - a. ANSI/UL 268 -Smoke Detectors for Fire Alarm Signaling Systems
    - b. CAN/ULC-S529- Smoke Detectors for Fire Alarm Systems
    - c. FM 3230-3250- Smoke Actuated Detectors for Automatic Fire Alarm Signaling
- J. IntelliQuad™ PLUS Advanced Multi-Criteria Intelligent Fire/CO Detector

1. Advanced Multi-Criteria Fire/CO detector shall be NOTIFIER model # FCO-851 and shall be an addressable advanced multi-criteria smoke detector with a separate signal for carbon monoxide (CO) detection per UL 2075 standards.
2. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical CO sensor, a daylight-filtered infrared (IR) sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.
3. The advanced multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in order to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The detector shall be capable of selecting the appropriate sensitivity levels based on the environment type (office, manufacturing, kitchen, etc.) in which it is installed, and then have the ability to automatically change the setting as the environment changes.
4. The CO detector component shall be capable of a functional gas test using a canned test agent to test the functionality of the CO sensing cell.
5. The detector shall be capable of automatically adjusting its sensitivity by means of drift compensation and smoothing algorithms. The device shall provide unique signals to indicate when 20 percent of the drift range is remaining, when 100 percent of drift range is used, and when there is a chamber fault to show the unit requires maintenance.
6. The detector shall indicate CO trouble conditions, including six months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self test failure, IR self test failure, and freeze warning.
7. The detector shall provide address-setting means on the detector head using rotary switches. Because of the possibility of installation error, systems that use binary jumpers or DIP switches to set the detector address are not acceptable. The detector shall also store an internal identifying code that the control panel shall use to identify the type of detector. Systems that require a special programmer to set the detector address (including temporary connection at the panel) are labor intensive and not acceptable. Each detector occupies any one of at least 159 possible addresses on the signaling line circuit (SLC) loop. It responds to regular polls from the system and reports its type and status.
8. The detector shall provide a test means whereby it will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a switch) or initiated remotely on command from the control panel. There shall be four test methods: functional magnet, smoke entry aerosol, carbon monoxide aerosol or direct heat method.
9. The detector shall provide two LEDs to provide 360° visibility. The LEDs shall be placed into steady red illumination by the control panel indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED. The detector must be capable of connecting to a sounder base that provides both temporal 3 and temporal 4 patterns for fire and CO alarm.
10. Two LEDs on the sensor shall be controlled by the panel to indicate sensor status. Coded signals, transmitted from the panel, shall cause the LEDs to blink, latch on, or latch off. Refer to the control panel technical documentation for sensor LED status operation and expected delay to alarm.
11. The detector shall be plug-in mounted into a twist-lock base. The detector shall be constructed of off-white, UV-resistant polymer and shall be detachable from the

mounting base to simplify installation, service and maintenance. Mounting base wiring connections shall be made by means of SEMS screws. The detector shall allow pre-wiring of the base and the head shall be a plug-in type. The mounting base shall be mounted on a junction box that is at least 1.5 inches (3.81 cm) deep. The mounting base shall be available to mount to standard junction boxes. Suitable boxes include:

- a. 4.0" (10.16 cm) square box with and without plaster ring.
- b. 4.0" (10.16 cm) octagonal box.
- c. 3.5" (8.89 cm) octagonal box.
- d. Single-gang box.
- e. Double-gang box

12. Meets Agency Standards

- a. ANSI/UL 268 -Smoke Detectors for Fire Alarm Signaling Systems
- b. CAN/ULC-S529- Smoke Detectors for Fire Alarm Systems
- c. FM 3230-3250- Smoke Actuated Detectors for Automatic Fire Alarm Signaling
- d. UL 2075 – Gas and Vapor Detector and Sensors – Systems Connected

K. Intelligent Addressable Aspiration Detector: The intelligent aspiration detector shall be NOTIFIER model # FSA-8000 an addressable aspiration detector that communicates directly with the fire alarm control panel via the SLC communication protocol, no modules or high level interfaces shall be required. The fire alarm control panel shall support up to thirty one intelligent aspiration detectors per SLC loop. The aspiration detector shall have dual source (blue LED and infra-red laser) optical smoke detection for a wide range of fire detection with enhanced immunity to nuisance particulates. The FACP shall be capable of monitoring and annunciating up to five smoke event thresholds and eleven trouble conditions. Each event threshold shall be capable of being assigned a discrete type ID at the FACP.

L. Intelligent Addressable Reflected Beam Detector

1. The intelligent single-ended reflected beam smoke detector shall connect with two wires to the fire alarm control panel signaling line circuit (SLC). The detectors shall consist of a transmitter/receiver unit and a reflector and shall send data to the panel representing the analog level of smoke density. The detector shall be capable of being tested remotely via a keyswitch; NOTIFIER model # FSB-200. Model # FSB-200S shall be equipped with an integral sensitivity test feature.

M. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs. The addressable monitor module shall be NOTIFIER model # FMM-1 (Class A or B) or FMM-101 (Class B)
2. The IDC zone shall be suitable for Style D/Class A or Style B/Class B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7

- mm). This version need not include Style D or an LED.
4. For multiple dry contact monitoring a module shall be available that provides 10 Style B or 5 Style D input circuits; NOTIFIER model # XP10-M.
- N. Two Wire Detector Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device); NOTIFIER model # FZM-1.
  2. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
  3. For multiple 2-wire smoke detector circuit monitoring a module shall be available that provides 6 Style B/Class A or 3 Style D/Class B input circuits; NOTIFIER model # XP6-MA.
- O. Addressable Control Module
1. Addressable control modules shall be provided to supervise and control the operation of one conventional circuit of compatible Notification Appliances, 24 VDC powered, polarized audio/visual notification appliances; NOTIFIER model # FCM-1
  2. The control module NAC may be wired for Style Z or Style Y (Class A/B) with a current rating of 2 Amps for Style Z and 3 Amps for Style Y;
  3. Audio/visual power shall be provided by a separate supervised circuit from the main fire alarm control panel or from a supervised UL listed remote supply.
  4. For multiple circuit control a module shall be available that provides 6 Style Y (Class B) or 3 Style Z (Class A) control circuits; NOTIFIER model # XP6-C.
- P. Addressable Releasing Control Module
1. An addressable FlashScan releasing module shall be available to supervise and control compatible releasing agent solenoids; NOTIFIER model # FCM-1-REL.
  2. The module shall operate on a redundant protocol for added protection.
  3. The module shall be configurable for Style Z or Style Y (Class A/B) and support one 24 volt or two 12 volt solenoids. Add FMM-4-20
- Q. Addressable 4-20 mA module shall be available to monitor industry-standard, linear-scale, 4-20 mA protocol sensors. The module converts the sensor output to communication protocol that can be interpreted by the FACP for monitoring and display; NOTIFIER model # FMM-4-20.
1. The module shall support programming of up to five programmable event thresholds.
  2. The System shall be FM 6320 (Factory Mutual) approved as a Gas Detection system when employed with the FMM-4-20 monitor module and industry standard 4-20 mA gas detectors.
- R. Addressable Relay Module:
1. Addressable Relay Modules shall be available for HVAC control and other network building functions; NOTIFIER model # FRM-1.

2. The module shall provide two form C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.
  3. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary devices energize at the same time on the same pair of wires;
  4. For multiple relay control a module shall be available that provides 6 programmable Form-C relays; NOTIFIER model # XP6-R.
- S. Addressable Two-In / Two-Out Monitor/Relay Module:
1. An addressable Two-In / Two-Out module shall be available; NOTIFIER model # FDRM-1.
  2. The two-in/two-out module shall provide two Class B/Style B dry-contact input circuits and two independent Form-C relays rated at up to 3 Amps resistive and up to 2.0 Amps inductive.
- T. Isolator Module: Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building; NOTIFIER model # ISO-X.
1. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
  2. The isolator module shall not require address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
  3. The isolator module shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
- U. Serially Connected Annunciator Requirements
1. The annunciator shall communicate to the fire alarm control panel via an EIA 485 (multi-drop) two-wire communications loop. The system shall support two 6,000 ft. EIA-485 wire runs. Up to 32 annunciator's, each configured up to 96 points, may be connected to the connection, for a system capacity of 3,072 points of annunciation.
  2. An EIA-485 repeater shall be available to extend the EIA-485 wire distance in 3,000 ft. increments. The repeater shall be UL864 approved.
  3. Each annunciator shall provide up to 96 alarm and 97 trouble indications using a long-life programmable color LED's. Up to 96 control switches shall also be available for the control of Fire Alarm Control Panel functions. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge and lamp test switch, and custom zone/function identification labels.
  4. The annunciator may be field configured to operate as a "Fan Control Annunciator". When configured as "Fan Control," the annunciator may be used to manually control fan or damper operation and can be set to override automatic commands to all fans/dampers programmed to the annunciator.

5. Annunciator switches may be programmed for System control such as, Global Acknowledge, Global Signal Silence, Global System Reset, and on/off control of any control point in the system.
6. An optional module shall be available to utilize annunciator points to drive EIA-485 driven relays. This shall extend the system point capacity by 3,072 remote contacts.
7. The LED annunciator shall offer an interface to a graphic style annunciator and provide each of the features listed above.

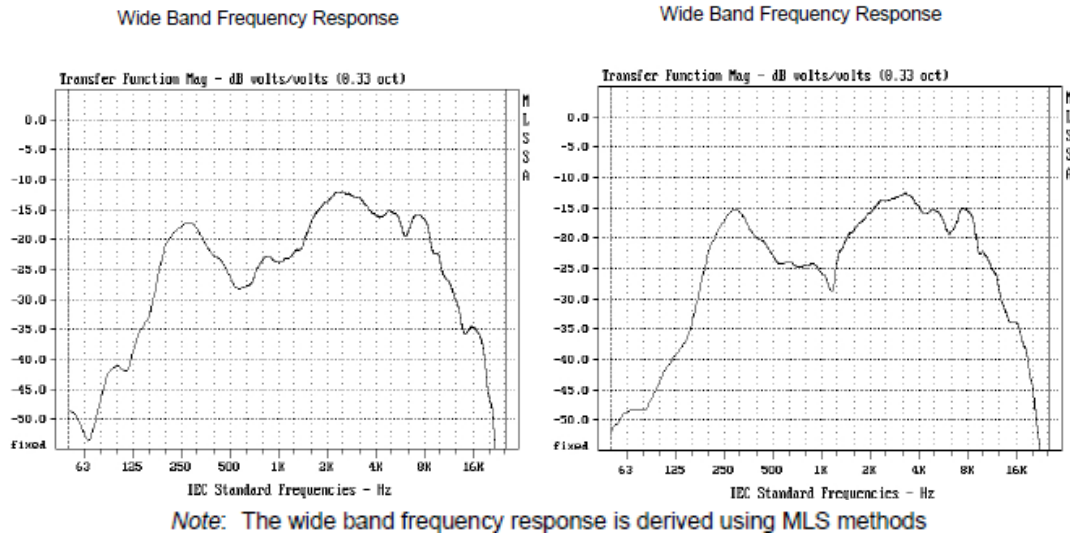
V. SpectrAlert Advance Speakers

1. The Speaker appliance shall be System Sensor SpectrAlert Advance model \_\_\_\_\_ Speaker. The speaker shall be listed to UL 1480 for Fire Protective Signaling Systems. It shall be a dual-voltage transformer speaker capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate.
3. Speakers shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker design shall isolate speaker components to reduce ground fault incidents.
4. The speaker shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction.
5. All notification appliances shall be backward compatible.

Ceiling Speaker

Wall Speaker





W. SpectrAlert Advance Speaker Strobes

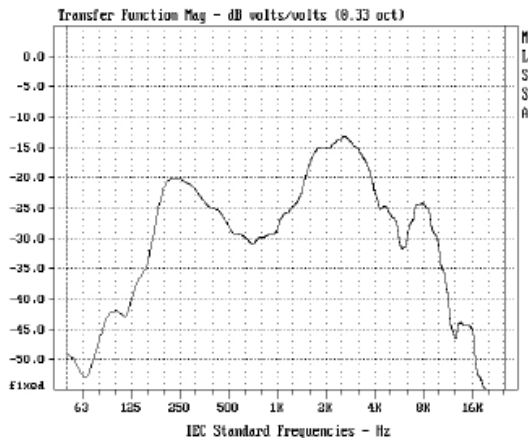
1. The Speaker Strobe appliance shall be System Sensor SpectrAlert Advance model \_\_\_\_\_ Speaker Strobe. The speaker strobe shall be listed to UL 1971 and UL 1480 and be approved for fire protective signaling systems. It shall be a dual-voltage transformer speaker strobe capable of operation at 25.0 or 70.7 nominal Vrms. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. It shall mount to a 4 x 4 x 2 1/8-inch back box.
2. A universal mounting plate shall be used for mounting ceiling and wall speaker strobe products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance speaker strobes and the Sync•Circuit™ Module MDL3 accessory, if used, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts (includes fire alarm panels with built in sync). When used with the Sync•Circuit Module MDL3, 12-volt rated notification appliance circuit outputs shall operate between 8.5 and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 16.5 to 33 volts. If the notification appliances are not UL 9th edition listed with the corresponding panel or power supply being used, then refer to the compatibility listing of the panel to determine maximum devices on a circuit.
3. Speaker strobes shall be plug-in and shall have the ability to check wiring continuity via a shorting spring on the universal mounting plate. The shorting spring shall also provide tamper resistance via an open circuit if the device is removed. Speaker strobe design shall isolate speaker components to reduce ground fault incidents.
4. The speaker strobe shall have power taps (from ¼ watt to 2 watts) and voltage that are selected by rotary switches. All models shall have a maximum sound output of 86 dB at 10 feet and shall incorporate an open back construction. The strobe shall consist of a xenon flash tube with associated lens/reflector system and operate on either 12V or 24V. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12V and 15, 15/75, 30, 75, 110, or 115 when operating on 24V. The strobe shall comply with NFPA 72 and the Americans with Disabilities Act

requirement for visible signaling appliances, flashing at 1 Hz over the strobe’s entire operating voltage range.

- 5. All notification appliances shall be backward compatible.

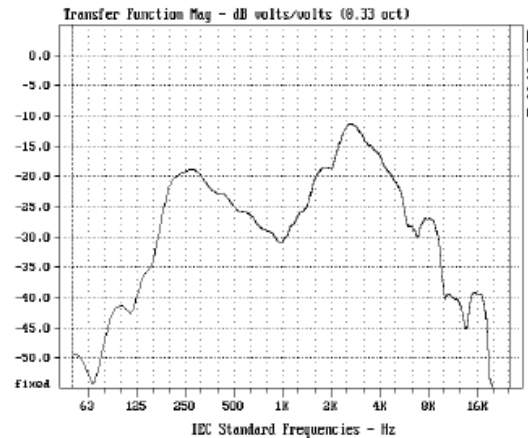
**Ceiling Speaker Strobe**

Wide Band Frequency Response



**Wall Speaker Strobe**

Wide Band Frequency Response



Note: The wide band frequency response is derived using MLS methods

- 6. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and be fully synchronized.

PART - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
- C. All fire detection and alarm system devices, control panels and remote annunciator’s shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.
- E. Any change from specification drawings plans must be submitted by a Registered Electrical Engineer and approved by Engineer of Record.
- F. Wiring shall be installed in conduit as specified under the electrical section of the specification

(Section 260501).

- G. The sum of the cross-sectional areas of individual conductors shall not exceed 40% of the interior cross sectional area of the conduit. Minimum conduit size shall be 3/4 inch trade size.
- H. Wiring shall be identified at terminal and junction locations to prevent unintentional interference with the circuits during testing and servicing.
- I. Junction, pull and terminal boxes/cabinets shall be labeled. Labels shall be permanently affixed to covers/doors. Labeling to be Furnished and Installed under Section 260501.
- J. Wiring color code shall be consistent throughout the system and shall allow for easy identification of initiating, indicating and auxiliary control circuits.
- K. Wiring at building terminal cabinets shall be terminated to screw barrier strips, with circuits identified.
- L. Wiring in control, terminal and junction cabinets shall be neatly arranged and bundled.
- M. Wiring shall test free of earth grounds or shorts between conductors.
- N. The contractor shall be responsible and assure the use of adequate numbers of skilled workmen, who are thoroughly trained and experienced, and completely familiar with the specified equipment and code requirements.
- O. The contractor shall be responsible for assuring that conduit size, wire type and color coding meets the specification, manufacturers and code requirements.

### 3.2 SYSTEM VERIFICATION

- A. Upon completion of the installation, the fire alarm contractor shall place into operation and test all operational features, functions and devices.
- B. Upon completion of testing, and after the system has been in operation for a minimum of 5 days without failure, the fire alarm contractor shall schedule with the Authority Having Jurisdiction (DSA INSPECTOR), Architect and Engineer, a demonstration and field acceptance test.
- C. Field acceptance and approval of the fire alarm system shall be evidenced in writing by the Authority Having Jurisdiction.
- D. Prior to scheduling field acceptance, the fire alarm system contractor shall certify in writing, and record the method of testing, the results of all tests and certify that the system has been in operation a minimum of 5 days.
- E. All testing shall be conducted in accordance with NFPA-72, contract documents, manufacturer's instructions and per the requirements of the Authority Having Jurisdiction.

### 3.3 GUARANTEE AND SERVICE

- A. Fire alarm system contractor shall provide written guarantees for all fire alarm equipment and devices used on this project for a period of THREE (3) YEARS from the date of final acceptance.
- B. During the guarantee period the contractor shall repair or replace any defective material at no additional cost to the Owner.

#### 3.4 IN SERVICE TRAINING

- A. The fire alarm contractor shall provide factory trained representatives to demonstrate the operation of the fire alarm system to the Owner's personnel. The representative shall have a thorough knowledge of the equipment and operation of the system. The contractor shall provide one (1) 4 hour in-service training session.
- B. The fire alarm contractor shall provide to the Authority Having Jurisdiction a demonstration of system operation. Session shall consist of one (1) 4 hour in-service training.

#### 3.5 OPERATION MAINTENANCE MANUALS

- A. The fire alarm contractor shall provide to the Engineer, three (3) weeks after the field acceptance test, two (2) sets of operating/maintenance manuals and one (1) set of as-built drawings.
- B. As-built drawings shall indicate the location of all devices, appliances, coding, zoning, wiring sequences, wiring methods, color coding, identification, labeling and connections of the components of the fire alarm system as installed. The as-builts shall include a mapping sequence as generated by the Fire Alarm Control Panel and connected computer. Systems not capable of this feature shall generate TRUE Device mapping sequences as-builts on Auto Cad 14. These as-builts shall show the physical layout of all addressable devices as they were actually installed on the loop.

END OF SECTION 283100

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## FIRE ALARM SUBMITTAL



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06/06/2018

# NFS2-640(E)

## Intelligent Addressable Fire Alarm System



### Intelligent Fire Alarm Control Panels

#### General

The NFS2-640 intelligent Fire Alarm Control Panel is part of the ONYX® Series of Fire Alarm Controls from NOTIFIER.

In stand-alone or network configurations, ONYX Series products meet virtually every application requirement.

The NFS2-640's modular design makes system planning easier. The panel can be configured with just a few devices for small building applications, or networked with many devices to protect a large campus or a high-rise office block. Simply add additional peripheral equipment to suit the application.

A host of other options are available, including single- or multi-channel voice; firefighter's telephone; LED, LCD, or PC-based graphic annunciators; networking; advanced detection products for challenging environments; wireless fire protection; and many additional options.

**NOTE:** Unless called out with a version-specific "E" at the end of the part number, "NFS2-640" refers to models NFS2-640 and NFS2-640E; similarly, "CPU2-640" refers to models CPU2-640 and CPU2-640E.

#### Features

- Certified for seismic applications when used with the appropriate seismic mounting kit.
- Approved for Marine applications when used with listed compatible equipment. See DN-60688.
- One, expandable to two, isolated intelligent Signaling Line Circuit (SLC) Style 4, 6 or 7.
- Wireless fire protection using SWIFT Smart Wireless Integrated Fire Technology. See DN-60820.
- Up to 159 detectors and 159 modules per SLC; 318 devices per loop/636 per FACP or network node.
  - Detectors can be any mix of ion, photo, thermal, or multi-sensor; wireless detectors are available for use with the FWSG.
  - Modules include addressable pull stations, normally open contact devices, two-wire smoke detectors, notification, or relay; wireless modules are available for use with the FWSG.
- Standard 80-character display, 640-character large display (NCA-2), or display-less (a node on a network).
- Network options:
  - High-speed network for up to 200 nodes (NFS2-3030, NFS2-640, NFS-320(C), NFS-320SYS, NCA-2, DVC-EM, ONYX-Works, NFS-3030, NFS-640, and NCA).
  - Standard network for up to 103 nodes (NFS2-3030, NFS2-640, NFS-320(C), NFS-320SYS, NCA-2, DVC-EM, ONYX-Works, NCS, NFS-3030, NFS-640, NCA, AFP-200, AFP-300/400, AFP-1010, and AM2020). Up to 54 nodes when DVC-EM is used in network paging.
- 6.0 A switch mode power supply with four Class A/B built-in Notification Appliance Circuits (NAC). Selectable System Sensor, Wheelock, or Gentex strobe synchronization.
- Built-in Alarm, Trouble, Security, and Supervisory relays.
- VeriFire® Tools online or offline programming utility. Upload/Download, save, store, check, compare, and simulate panel databases. Upgrade panel firmware.
- Autoprogramming and Walk Test reports.
- Multiple central station communication options:
  - Standard UDACT
  - Internet
  - Internet/GSM
- 80-character remote annunciators (up to 32).



NFS2-640-DVC\_right.jpg

**NFS2-640**

- EIA-485 annunciators, including custom graphics.
- Printer interface (80-column and 40-column printers).
- History file with 800-event capacity in nonvolatile memory, plus separate 200-event alarm-only file.
- Alarm Verification selection per point, with automatic counter.
- Presignal/Positive Alarm Sequence (PAS).
- Silence inhibit and Auto Silence timer options.
- March time/temporal/California two-stage coding/strobe synchronization.
- Field-programmable on panel or on PC, with VeriFire Tools program check, compare, simulate.
- Full QWERTY keypad.
- Battery charger supports 18 – 200 AH batteries.
- Non-alarm points for lower priority functions.
- Remote ACK/Signal Silence/System Reset/Drill via monitor modules.
- Automatic time control functions, with holiday exceptions.
- Surface Mount Technology (SMT) electronics.
- Extensive, built-in transient protection.
- Powerful Boolean logic equations.
- Support for SCS Series smoke control system in HVAC mode.

#### **NCA-2 as PRIMARY DISPLAY**

- Backlit, 640-character display.
- Supports SCS Series smoke control system in FSCS mode when SCS is connected to the NCA-2 used as primary display.
- Supports DVC digital audio loop.
- Printer and CRT EIA-232 ports.
- EIA-485 annunciator and terminal mode ports.
- Alarm, Trouble, Supervisory, and Security relays.

## FLASHSCAN® INTELLIGENT FEATURES

- Polls up to 318 devices in less than two seconds.
- Activates up to 159 outputs in less than five seconds.
- Multicolor LEDs blink device address during Walk Test.
- Fully digital, high-precision protocol (U.S. Patent 5,539,389).
- Manual sensitivity adjustment — up to nine levels.
- Pre-alarm ONYX intelligent sensing — up to nine levels.
- Day/Night automatic sensitivity adjustment.
- Sensitivity windows:
  - Ion — 0.5 to 2.5%/foot obscuration.
  - Photo — 0.5 to 2.35%/foot obscuration.
  - Laser (VIEW®) — 0.02 to 2.0%/foot obscuration.
  - Acclimate Plus™ — 0.5 to 4.0%/foot obscuration.
  - IntelliQuad™ — 1.0 to 4.0%/foot obscuration.
  - IntelliQuad™ PLUS — 1.0 to 4.0%/foot obscuration
- Drift compensation (U.S. Patent 5,764,142).
- Degraded mode — in the unlikely event that the CPU2-640 microprocessor fails, FlashScan detectors revert to degraded operation and can activate the CPU2-640 NAC circuits and alarm relay. Each of the four built-in panel circuits includes a Disable/Enable switch for this feature.
- Multi-detector algorithm involves nearby detectors in alarm decision (U.S. Patent 5,627,515).
- Automatic detector sensitivity testing (NFPA-72 compliant).
- Maintenance alert (two levels).
- Self-optimizing pre-alarm.

## FSL-751 (VERY INTELLIGENT EARLY WARNING)

### SMOKE DETECTION TECHNOLOGY

- Advanced ONYX intelligent sensing algorithms differentiate between smoke and non-smoke signals (U.S. Patent 5,831,524).
- Addressable operation pinpoints the fire location.

- Early warning performance comparable to the best aspiration systems at a fraction of the lifetime cost.

## FAPT-851 ACCLIMATE PLUS

### LOW-PROFILE INTELLIGENT MULTI-SENSOR

- Detector automatically adjusts sensitivity levels without operator intervention or programming. Sensitivity increases with heat.
- Microprocessor-based technology; combination photo and thermal technology.
- Low-temperature warning signal at 40°F ± 5°F (4.44°C ± 2.77°C).

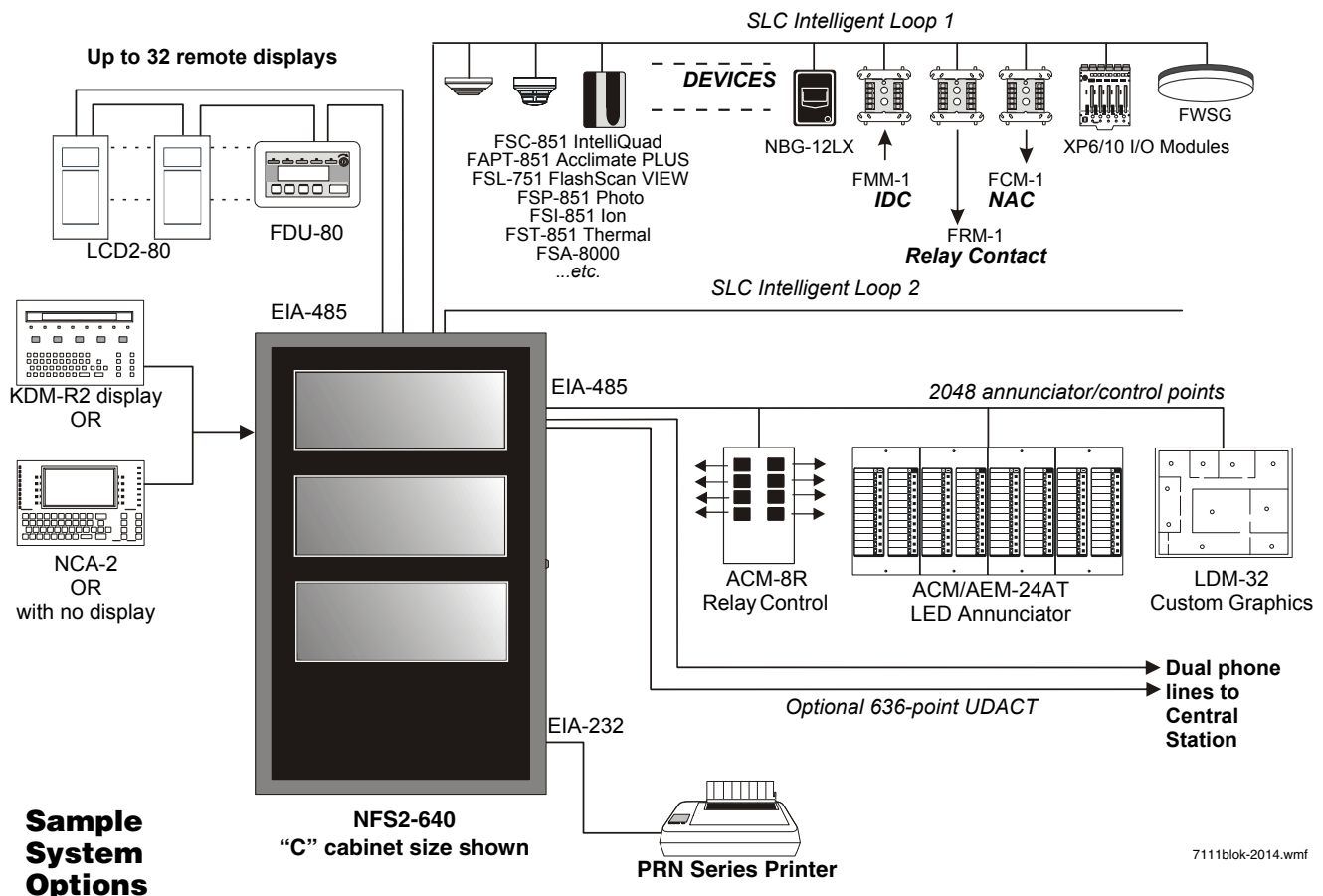
## FSC-851 INTELLIQUAD

### ADVANCED MULTI-CRITERIA DETECTOR

- Detects all four major elements of a fire (smoke, heat, CO, and flame).
- Automatic drift compensation of smoke sensor and CO cell.
- High nuisance-alarm immunity.

## INTELLIGENT FAAST® DETECTORS FSA-5000, FSA-8000, FSA-20000 AND FSA-20000P

- Connects directly to the SLC loop of compatible ONYX series panels.
- Provides five event thresholds that can be individually programmed with descriptive labels for control-by-event programming; uses five detector addresses.
- Uses patented particle separator and field-replaceable filter to remove contaminants.
- Advanced algorithms reject common nuisance conditions
- FSA-5000 covers 5,000 square feet through one pipe.
- FSA-8000 covers 8,000 square feet through one pipe.
- FSA-20000 covers 28,800 square feet through one to four pipes.



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- FSA-20000P covers 28,800 square feet through one to four pipes. Supports addressable pipes to pinpoint location of alarm events

### **FCO-851 INTELLIQUAD™ PLUS**

#### **ADVANCED MULTI-CRITERIA FIRE/CO DETECTOR**

- Detects all four major elements of a fire.
- Separate signal for life-safety CO detection.
- Optional addressable sounder base for Temp-3 (fire) or Temp-4 (CO) tone.
- Automatic drift compensation of smoke sensor and CO cell.
- High nuisance-alarm immunity.

#### **SWIFT WIRELESS**

- Self-healing mesh wireless protocol.
- Each SWIFT Gateway supports up to 50 devices: 1 wireless gateway and up to 49 SWIFT devices.
- Up to 4 wireless gateways can be installed with overlapping network coverage.

#### **RELEASING FEATURES**

- Ten independent hazards.
- Sophisticated cross-zone (three options).
- Delay timer and Discharge timers (adjustable).
- Abort (four options).
- Low-pressure CO2 listed.

#### **DIGITAL VOICE AND TELEPHONE FEATURES**

- Up to eight channels of digital audio.
- 35, 50, 75, and 100/125 watt digital amplifiers (DAA2/DAX series and DS series; NCA-2 required as primary display).
- Solid-state digital message generation.
- Firefighter telephone option.
- 30- to 120-watt high-efficiency amplifiers (AA Series).
- Backup tone generator and amplifier option.
- NFS2-640 can also integrate with the FirstCommand Emergency Communications System. See DN-60772.

#### **HIGH-EFFICIENCY OFFLINE SWITCHING**

##### **3.0 A POWER SUPPLY (6.0 A IN ALARM)**

- 120 VAC (NFS2-640); 240 VAC (NFS2-640E).
- Displays battery current/voltage on panel (with display).

## **FlashScan, Exclusive World-Leading Detector Protocol**

At the heart of the NFS2-640 is a set of detection devices and device protocol — FlashScan (U.S. Patent 5,539,389). FlashScan is an all-digital protocol that gives superior precision and high noise immunity.

In addition to providing quick identification of an active input device, this protocol can also activate many output devices in a fraction of the time required by competitive protocols. This high speed also allows the NFS2-640 to have the largest device per loop capacity in the industry — 318 points — yet every input and output device is sampled in less than two seconds. The microprocessor-based FlashScan detectors have bicolor LEDs that can be coded to provide diagnostic information, such as device address during Walk Test.

## **ONYX Intelligent Sensing**

Intelligent sensing is a set of software algorithms that provides the NFS2-640 with industry-leading smoke detection capability. These complex algorithms require many calculations on each reading of each detector, and are made possible by the high-speed microcomputer used by the NFS2-640.

**Drift Compensation and Smoothing:** Drift compensation allows the detector to retain its original ability to detect actual smoke, and resist false alarms, even as dirt accumulates. It reduces maintenance requirements by allowing the system to automatically perform the periodic sensitivity measurements required by NFPA 72. Smoothing filters are also provided by software to remove tran-

sient noise signals, such as those caused by electrical interference.

**Maintenance Warnings:** When the drift compensation performed for a detector reaches a certain level, the performance of the detector may be compromised, and special warnings are given. There are three warning levels: (1) Low Chamber value; (2) Maintenance Alert, indicative of dust accumulation that is near but below the allowed limit; (3) Maintenance Urgent, indicative of dust accumulation above the allowed limit.

**Sensitivity Adjust:** Nine sensitivity levels are provided for alarm detection. These levels can be set manually, or can change automatically between day and night. Nine levels of pre-alarm sensitivity can also be selected, based on predetermined levels of alarm. Pre-alarm operation can be latching or self-restoring, and can be used to activate special control functions.

**Self-Optimizing Pre-Alarm:** Each detector may be set for “Self-Optimizing” pre-alarm. In this special mode, the detector “learns” its normal environment, measuring the peak analog readings over a long period of time, and setting the pre-alarm level just above these normal peaks.

**Cooperating Multi-Detector Sensing:** A patented feature of ONYX intelligent sensing is the ability of a smoke sensor to consider readings from nearby sensors in making alarm or pre-alarm decisions. Without statistical sacrifice in the ability to resist false alarms, it allows a sensor to increase its sensitivity to actual smoke by a factor of almost two to one.

## **Field Programming Options**

**Autoprogram** is a timesaving feature. The FACP “learns” what devices are physically connected and automatically loads them in the program with default values for all parameters. Requiring less than one minute to run, this routine allows the user to have almost immediate fire protection in a new installation, even if only a portion of the detectors are installed.

**Keypad Program Edit (with KDM-R2)** The NFS2-640, like all NOTIFIER intelligent panels, has the exclusive feature of program creation and editing capability from the front panel keypad, while continuing to provide fire protection. The architecture of the NFS2-640 software is such that each point entry carries its own program, including control-by-event links to other points. This allows the program to be entered with independent per-point segments, while the NFS2-640 simultaneously monitors other (already installed) points for alarm conditions.

VeriFire® Tools is an offline programming and test utility that can greatly reduce installation programming time, and increase confidence in the site-specific software. It is Windows®-based and provides technologically advanced capabilities to aid the installer. The installer may create the entire program for the NFS2-640 in the comfort of the office, test it, store a backup file, then bring it to the site and download from a laptop into the panel.

## **Placement of Equipment in Chassis and Cabinet**

The following guidelines outline the NFS2-640's flexible system design.

**Rows:** The first row of equipment in the cabinet mounts in the chassis shipped with the FACP. Mount the second, third, or fourth rows of equipment in a CHS-4 series chassis or, for Digital Voice Command products, in CA-1 or CA-2. (For DVC-EM and DAA2/DAX components see *DVC Manual*; for DS series components see *DS-AMP Manual*; for DVC-AO applications, see *AA Series Installation Manual*). Other options are available; see your panel's installation manual.

**Wiring:** When designing the cabinet layout, consider separation of power-limited and non-power-limited wiring as discussed in the *NFS2-640 Installation Manual*.

**Positions:** A chassis offers four basic side-by-side positions for components; the number of modules that can be mounted in each position depends on the chassis model and the size of the individual module. There are a variety of standoffs and hardware items available for different combinations and configurations of components.



It is critical that all mounting holes of the NFS2-640 are secured with a screw or standoff to ensure continuity of Earth Ground.

**Layers:** The control panel's chassis accepts four layers of equipment, including the control panel. The CPU2-640 fills three positions (left to right) in the first-installed layer (the back of the chassis); its integral power supply occupies the center two positions in the next two layers; the optional display occupies (the left) two positions at the front, flush with the door. Some equipment, such as the NCA-2, may be mounted in the dress panel directly in front of the control panel. The NCA-2 can be used as a primary display for the NFS2-640 (use NCA/640-2-KIT) by directly connecting their network ports (required in Canadian stand-alone applications); see NCA-2 data sheet for mounting options (DN-7047).

**Expansion:** Installing an LEM-320 Loop Expander Module adds a second SLC loop to the control panel. The LEM-320 is mounted onto the CPU2-640, occupying the middle-right, second (back) slot on the chassis.

**Networking:** If networking two or more control panels, each unit requires a Network Communication Module or High-Speed Network Communication Module. (HS-NCM can support two nodes; see "Networking Options" on page 4). These modules can be installed in any option board position (see manual), and additional option boards can be mounted in front of the network communication modules.

## KDM-R2 Controls and Indicators

**Program Keypad:** QWERTY type (*keyboard layout, see figure*).

**12 LED indicators:** Power; Fire Alarm; Pre-Alarm; Security; Supervisory; System Trouble; Signals Silenced; Points Disabled; Control Active; Abort; Pre-Discharge; Discharge.

**Keypad Switch Controls:** Acknowledge/Scroll Display; Signal Silence; Drill; System Reset; Lamp Test.

**LCD Display:** 80 characters (2 x 40) with long-life LED backlight.

## Product Line Information

- "Configuration Guidelines" on page 4
- "Networking Options" on page 4
- "Auxiliary Power Supplies and Batteries" on page 4
- "Audio Options" on page 5
- "Compatible Devices, EIA-232 Ports" on page 5
- "Compatible Devices, EIA-485 Ports" on page 5
- "Compatible Intelligent Devices" on page 5
- "Enclosures, Chassis, and Dress Plates" on page 6
- "Other Options" on page 7

## CONFIGURATION GUIDELINES

*Stand-alone and network systems require a main display. On systems with one FACP (one CPU2-640/-640E), display options are the KDM-R2 or the NCA-2. On network systems (two or more networked fire panel nodes), at least one NCA-2, NCS, or ONYX-Works announcement device is required. Other options listed as follows;*

**KDM-R2:** 80-character backlit LCD display with QWERTY programming and control keypad. Order two BMP-1 blank modules and DP-DISP2 mounting plate separately. *Requires top row of a cabinet. Required for each stand-alone 80-character display system. The KDM-R2 may mount in network nodes to display "local" node information as long as at least one NCA-2 or NCS/ONYX-Works network display is on the system to display network information. (Non-English versions also available: KDM-R2C for ULC application, KDM-R2-FR, KDM-R2-PO, KDM-R2-SP.)*

**NCA-2:** Network Control Annunciator, 640 characters. On single CPU2-640/-640E systems, the optional NCA-2 can be used as the Primary Display for the panel and connects directly to the CPU2-640/-640E. On network systems (two or more networked fire panel nodes), one network display (either NCA-2 or NCS/ONYXWorks) is required for every system. On network systems, the NCA-2 connects to (and requires) a standard Network Communication Module or High-Speed Network Communication Module. Mounts in a row of FACP node or in two annunciator positions. Mounting

options include the DP-DISP2, ADP-4B, or in an annunciator box, such as the ABS-2D. In CAB-4 top-row applications, a DP-DISP2 and two BMP-1 blank modules are required for mounting. Required for NFS2-640 applications employing the DVC-EM with DAL devices. Non-English versions are available. NCA-2 are available for ULC applications. For marine applications, order NCA-2-M; for non-English Marine applications, order NCA-2-M and the appropriate KP-KIT-XX. *See DN-7047.*

**CPU2-640:** Central processing unit (CPU) with integral 3.0 A (6.0 A in alarm) power supply for an NFS2-640 system. Includes control panel factory-mounted on a chassis; one Signaling Line Circuit expandable to two; documentation kit. *Order one per system or as necessary (up to 103 network nodes) on a network system. (Non-English versions also available: CPU2-640-FR, CPU2-640-PO, CPU2-640-SP.)*

**CPU2-640E:** Same as CPU2-640 but requires 240 VAC, 1.5 A, (3.0 A in alarm). *(Non-English versions also available: CPU2-640E-PO, CPU2-640E-SP.)*

**NCA/640-2-KIT:** Bracket installation kit required to mount NCA-2 to the CPU2-640/-640E's standard chassis.

**DP-DISP2:** Dress panel for top row in cabinet with CPU2-640/640E installed.

**ADP2-640:** Dress panel for middle rows with CPU2-640/640E.

**BMP-1:** Blank module for unused module positions.

**BP2-4:** Battery plate, required.

**LEM-320:** Loop Expander Module. Expands each NFS2-640 to two Signaling Line Circuits. *See DN-6881.*

## NETWORKING OPTIONS

**NCM-W, NCM-F:** Standard Network Communications Modules. Wire and multi-mode fiber versions available. *See DN-6861.*

**HS-NCM-W/MF/SF/WMF/WSF/MFSF:** High-speed Network Communications Modules that can connect to two nodes. Wire, single-mode fiber, multi-mode fiber, and media conversion models are available. *See DN-60454.*

**RPT-W, RPT-F, RPT-WF:** Standard-network repeater board with wire connection (RPT-W), multi-mode fiber connection (RPT-F), or allowing a change in media type between wire and fiber (RPT-WF). Not used with high-speed networks. *See DN-6971.*

**ONYXWorks:** UL-listed graphics PC workstation, software, and computer hardware. *See DN-7048 for specific part numbers.*

**NFN-GW-EM-3:** NFN Gateway, embedded. (Replaces NFN-GW-EM.) *See DN-60499.*

**NWS-3: NOTI•FIRE•NET™** Web Server. *See DN-6928.*

**CAP-GW:** Common Alerting Protocol Gateway. *See DN-60756.*

**VESDA-HLI-GW:** VESDAnet high-level interface gateway. *See DN-60753.*

**LEDSIGN-GW:** UL-listed sign gateway. Interfaces with classic and high-speed NOTI•FIRE•NET networks through the NFN Gateway. *See DN-60679.*

**OAX2-24V:** UL-listed LED sign, used with LEDSIGN-GW. *See DN-60679.*

## AUXILIARY POWER SUPPLIES AND BATTERIES

**ACPS-610:** 6.0 A or 10.0 A addressable charging power supply. *See DN-60244.*

**APS2-6R:** Auxiliary Power Supply. Provides up to 6.0 amperes of power for peripheral devices. Includes battery input and transfer relay, and overcurrent protection. Mounts on two of four positions on a CHS-4L or CHS-4 chassis. *See DN-5952.*

**FCPS-24S6/S8:** Remote 6 A and 8 A power supplies with battery charger. *See DN-6927.*

**BAT Series:** Batteries. NFS2-640 uses two 12 volt, 18 to 200 AH batteries. *See DN-6933.*

## AUDIO OPTIONS

**NOTE:** For mounting hardware, see "Enclosures, Chassis, and Dress Plates" on page 6 and peripheral data sheets.

**DVC-EM:** Digital Voice Command, digital audio processor with message storage for up to 32 minutes of standard quality (4 minutes at high quality) digital audio. Capable of playing up to eight simultaneous messages when used with Digital Audio Loop (DAL) devices. See DN-7045.

**DVC-RPU:** Digital Voice Command Remote Paging Unit for use with DVC-EM. Includes the keypad/display. See DN-60726.

**DS-DB:** Digital Series Distribution Board, provides bulk amplification capabilities to the DVC-EM while retaining digital audio distribution capabilities. Can be configured with up to four DS-AMPs, supplying high-level risers spread throughout an installation. See DN-60565.

**DVC-KD:** DVC-EM keypad for local annunciation and controls; status LEDs and 24 user-programmable buttons. See DN-7045.

**DS-AMP/E:** 125W, 25 VRMS, or 100W, 70VRMS. 70VRMS requires DS-XF70V step-up transformer. Digital Series Amplifier, part of the DS-DB system. See DN-60663.

**DS-RFM, DS-FM, DS-SFM:** Fiber conversion modules for DVC-EM, DS-DB distribution board, and DAX and DAA2 Series amplifiers. See DN-60633.

**DVC-AO:** DVC Analog Output board provides four analog output circuits for use with AA Series amplifiers. Four-channel operation supported. See DN-7045.

**DAA2-5025(E):** 50W, 25 Vrms Digital Audio Amplifier assembly with power supply; includes chassis. See DN-60556.

**DAA2-5070(E):** 50W, 70.7 Vrms Digital Audio Amplifier assembly with power supply; includes chassis. See DN-60556.

**DAA2-7525(E):** 75W, 25 Vrms digital audio amplifier assembly with power supply; includes chassis. See DN-60556.

**DAX-3525(E):** 35W, 25 Vrms Digital Audio Amplifier assembly with power supply, includes chassis. See DN-60561.

**DAX-3570(E):** 35W, 70.7 Vrms Digital Audio Amplifier assembly with power supply, includes chassis. See DN-60561.

**DAX-5025(E):** 50W, 25 Vrms Digital Audio Amplifier assembly with power supply, includes chassis. See DN-60561.

**DAX-5070(E):** 50W, 70.7 Vrms Digital Audio Amplifier assembly with power supply, includes chassis. See DN-60561.

**TELH-1:** Firefighter's Telephone Handset for use with the DVC-EM when mounted in the CA-2 chassis. See DN-7045.

**CMIC-1:** Optional microphone and microphone well assembly used with the CA-1 chassis.

**RM-1/RM-1SA:** Remote microphone assemblies, mount on ADP-4 (RM-1) dress panel or CAB-RM-/RMR (RM-1SA) stand-alone cabinets. See DN-6728.

**AA-30:** Audio Amplifier, 30 watts, 25 Vrms. Includes amplifier and audio input supervision, backup input, and automatic switchover, power supply, cables. See DN-3224.

**AA-120/AA-100:** Audio Amplifier provides up to 120 watts of 25 VRMS audio power for the NFS-640. The amplifier contains an integral chassis for mounting to a CAB-B4, -C4, or -D4 backbox (consumes one row). Switch-mode power. Includes audio input and amplified output supervision, backup input, and automatic switchover to backup tone. Order the AA-100 for 70.7 VRMS systems and 100 watts of power. See DN-3224.

**DAA Series Digital Audio Amplifiers:** Legacy DAA Series amplifiers are compatible with DVC-EM systems running SR4.0. For specific information on DAA-50 series amplifiers, refer to DN-7046. For information on DAA-7525 Series, refer to DN-60257.

**NFC-25/50:** 25 watt, 25 VRMS, emergency Voice Evacuation Control Panel (VECP) with integral commercial microphone, digital message generator, and single-/dual-channel Class A or Class B speaker circuits. See DN-60772.

## COMPATIBLE DEVICES, EIA-232 PORTS

**PRN-7:** 80-column printer. See DN-60897.

**VS4095/5:** Printer, 40-column, 24V. Mounted in external backbox. See DN-3260.

**DPI-232:** Direct Panel Interface, specialized modem for extending serial data links to remotely located FACPs and/or peripherals. See DN-6870.

## COMPATIBLE DEVICES, EIA-485 PORTS

**ACM-24AT:** ONYX Series ACS annunciator – up to 96 points of annunciation with Alarm or Active LED, Trouble LED, and switch per circuit. Active/Alarm LEDs can be programmed (by powered-up switch selection) by point to be red, green, or yellow; the Trouble LED is always yellow. See DN-6862.

**AEM-24AT:** Same LED and switch capabilities as ACM-24AT, expands the ACM-24AT to 48, 72, or 96 points. See DN-6862.

**ACM-48A:** ONYX Series ACS annunciator – up to 96 points of annunciation with Alarm or Active LED per circuit. Active/Alarm LEDs can be programmed (by powered-up switch selection) in groups of 24 to be red, green, or yellow. Expandable to 96 points with one AEM-48A. See DN-6862.

**AEM-48A:** Same LED capabilities as ACM-48A, expands the ACM-48A to 96 points. See DN-6862.

**ACM-8R:** Remote Relay Module with eight Form-C contacts. Can be located up to 6,000 ft. (1828.8 m) from panel on four wires. See DN-3558.

**FDU-80:** Terminal mode. 80-character, backlit LCD display. Mounts up to 6,000 ft. (1828.8 m) from panel. Up to 32 per FACP. See DN-6820.

**LCD2-80:** Terminal and ACS mode. 80-character, backlit LCD display. Mounts up to 6,000 ft. (1828.8 m) from panel. Up to 32 per FACP. See DN-60548.

**LDM:** Lamp Driver Modules LDM-32, LDM-E32, and LDM-R32; remote custom graphic driver modules. See DN-0551.

**SCS:** Smoke control stations SCS-8, SCE-8, with lamp drivers SCS-8L, SCE-8L; eight (expandable to 16) circuits (HVAC only). See DN-4818.

**TM-4:** Transmitter Module. Includes three reverse-polarity circuits and one municipal box circuit. Mounts in panel module position (single-address-style) or in CHS2-M2 position. See DN-6860.

**UDACT-2:** Universal Digital Alarm Communicator Transmitter, 636 channel. See DN-60686.

**UZY-256:** Programmable Universal Zone Coder provides positive non-interfering successive zone coding. Microprocessor-controlled, field-programmable from IBM®-compatible PCs (requires optional programming kit). Up to 256 programmable codes. Mounts in BB-UZY or other compatible chassis (purchased separately). See DN-3404.

## COMPATIBLE INTELLIGENT DEVICES

**NOTE:** "A" suffix indicates ULC-Listed model.

**FWSG Wireless SWIFT Gateway:** Addressable gateway supports wireless SLC devices. Not appropriate for ULC applications. See DN-60820.

**FSA-5000:** Intelligent FFAST® XS Fire Alarm Aspiration Sensing Technology. Intelligent aspirating smoke detector for applications up to 5,000 sq.ft. For Canadian applications, order FSA-5000A.

**FSA-8000:** Intelligent FFAST® XM Fire Alarm Aspiration Sensing Technology. Intelligent aspirating smoke detector for applications up to 8,000 sq.ft. For Canadian applications, order FSA-8000A. See DN-60792.

**FSA-20000:** Intelligent FFAST® XT Fire Alarm Aspiration Sensing Technology. Intelligent aspirating smoke detector for applications up to 28,800 sq.ft. For Canadian applications, order FSA-20000A. See DN-60849.

**FSA-20000P FFAST® XT PRO** Intelligent Aspiration Detector For applications up to 28,800 sq. ft. (2601 sq. m.) through one to four addressable pipes. See DN-60792

**FSB-200(A):** Intelligent beam smoke detector. See DN-6985.

**FSB-200S(A):** Intelligent beam smoke detector with integral sensitivity test. See DN-6985.

**FSC-851(A):** FlashScan IntelliQuad Advanced Multi-Criteria Detector. *See DN-60412.*

**FCO-851(A):** FlashScan IntelliQuad PLUS Advanced Multi-Criteria Fire/CO Detector. *See DN-60689.*

**FSI-851(A):** Low-profile FlashScan ionization detector. *See DN-6934.*

**FSP-851(A):** Low-profile FlashScan photoelectric detector. *See DN-6935.*

**FSP-851T(A):** FSP-851 plus dual electronic thermistors that add 135°F (57°C) fixed-temperature thermal sensing. *See DN-6935.*

**FSP-851R(A):** FSP-851, remote-test capable. For use with DNR(W). *See DN-6935.*

**FST-851(A):** FlashScan thermal detector 135°F (57°C). *See DN-6936.*

**FST-851R(A):** FlashScan thermal detector 135°F (57°C) with rate-of-rise. *See DN-6936.*

**FST-851H(A):** FlashScan 190°F (88°C) high-temperature thermal detector. *See DN-6936.*

**FAPT-851(A):** FlashScan Acclimate Plus low-profile multi-sensor detector. *See DN-6937.*

**FSL-751(A):** FlashScan VIEW laser photo detector. *See DN-6886.*

**DNR(A):** InnovairFlex low-flow non-relay duct-detector housing (order FSP-851R separately). Replaces FSD-751PL/FSD-751RPL. *See DN-60429.*

**DNRW(A):** Same as above with NEMA-4 rating, watertight. *See DN-60429.*

**B224RB:** Low-profile relay base. *See DN-60054.*

**B224BI:** Isolator base for low-profile detectors. *See DN-60054.*

**B210LP:** Low-profile base. Standard U.S. style. Replaces B710LP. *See DN-60054.*

**B501(A):** European-style, 4" (10.16 cm) base. *See DN-60054.*

**B200S:** Intelligent programmable sounder base, capable of producing a variety of tone patterns including ANSI Temporal 3. Compatible with synchronization protocol. *See DN-60054.*

**B200S-LF:** Low-frequency version of B200S. *See DN-60054.*

**B200SCOA:** Based on B200SA, with added CO detector markings in English/French. For Canadian applications only.

**B200SR:** Sounder base, Temporal 3 or Continuous tone. *See DN-60054.*

**B200SR-LF:** Low-frequency version of B200SR. *See DN-60054.*

**FMM-1(A):** FlashScan monitor module. *See DN-6720.*

**FDM-1(A):** FlashScan dual monitor module. *See DN-6720.*

**FZM-1(A):** FlashScan two-wire detector monitor module. *See DN-6720.*

**FMM-101(A):** FlashScan miniature monitor module. *See DN-6720.*

**FTM-1(A):** Firephone Telephone Module connects a remote firefighter telephone to a centralized telephone console. Reports status to panel. Wiring to jacks and handsets is supervised. *See DN-6989.*

**FCM-1(A):** FlashScan control module. *See DN-6720.*

**FCM-1-REL(A):** FlashScan releasing control module. *See DN-60390.*

**FRM-1(A):** FlashScan relay module. *See DN-6720.*

**FDRM-1(A):** FlashScan dual monitor/dual relay module. *See DN-60709.*

**NBG-12LX:** Manual pull station, addressable. *See DN-6726.*

**ISO-X:** Isolator module. *See DN-2243.*

**ISO-6:** Six Fault isolator module. For Canadian applications order ISO-6A. *See DN-60844.*

**XP6-C(A):** FlashScan six-circuit supervised control module. *See DN-6924.*

**XP6-MA(A):** FlashScan six-zone interface module; connects intelligent alarm system to two-wire conventional detection zone. *See DN-6925.*

**XP6-R(A):** FlashScan six-relay (Form-C) control module. *See DN-6926.*

**XP10-M(A):** FlashScan ten-input monitor module. *See DN-6923.*

**SLC-IM:** SLC integration module, for VESDAnet detectors. *See DN-60755.*

## ENCLOSURES, CHASSIS, AND DRESS PLATES

**CAB-4 Series Enclosure:** NFS2-640 mounts in a standard CAB-4 Series enclosure (available in four sizes, "A" through "D"). Backbox and door ordered separately; requires BP2-4 battery plate. A trim ring option is available for semi-flush mounting. *See DN-6857.*

**EQ Series Cabinets:** EQ series cabinets will house amplifiers, power supplies, battery chargers and control modules. EQ cabinets are available in three sizes, "B" through "D". *See DN-60229.*

**CAB-BM Marine System:** Protects equipment in shipboard and waterfront applications. Also order **BB-MB** for systems using 100 AH batteries. For a full list of required and optional equipment, see *DN-60688.*

**CHS-4:** Chassis for mounting up to four APS-6Rs.

**CHS-4L:** Low-profile four-position Chassis. Mounts two AA-30 amplifiers or one AMG-E and one AA-30.

**DP-1B:** Blank dress panel. Provides dead-front panel for unused tiers; covers DAA2/DAX series or AA-series amplifier.

**NFS-LBB:** Battery Box (required for batteries larger than 26 AH).

**NFS-LBBR:** Same as above but red.

**CHS-BH1:** Battery chassis; holds two 12.0 AH batteries. Mounts one the left side of DAA2 chassis. *See DN-7046.*

**CA-1:** Chassis, occupies one tier of a CAB-4 Series enclosure. The left side accommodates one DVC-EM and a DVC-KD (optional); and the right side houses a CMIC-1 microphone and its well (optional). *See DN-7045.*

**CA-2:** Chassis assembly, occupies two tiers of a CAB-4 Series enclosure. The left side accommodates one DVC-EM mounted on a half-chassis and one NCA-2 mounted on a half-chassis. The right side houses a microphone/handset well. The CA-2 assembly includes CMIC-1 microphone. ADDR Series doors with two-tier visibility are available for use with the CA-2 configuration: ADDR-B4, ADDR-C4, ADDR-D4 (below).

**CFFT-1:** Chassis to mount firefighter's telephone and one ACS annunciator in a CAB-4 row. Includes TELH-1 firefighter's handset for the DVC-EM, chassis, phone well and mounting hardware. Order DP-CFFT dress panel separately.

**DP-CFFT:** CFFT-1 dress panel. Requires BMP-1 if no ACS annunciator is installed.

**ADDR-B4\*:** Two-tier-sized door designed for use with the CA-2 chassis configuration. ADDR Series doors are similar to CAB-4 Series "DR" doors, but a clear window space exposes the top two tiers of the CAB-4 enclosure. Use an SBB-B4 backbox with the ADDR-B4. *See DN-7045, DN-6857.*

**ADDR-C4\*:** Three-tier-sized door, designed for use with the CA-2 chassis configuration. ADDR Series doors are similar to CAB-4 Series "DR" doors, but a clear window space exposes the top two tiers of the CAB-4 enclosure. Use an SBB-C4 backbox with the ADDR-C4. *See DN-7045, DN-6857.*

**ADDR-D4\*:** Four-tier-sized door designed for use with the CA-2 chassis configuration. ADDR Series doors are similar to CAB-4 Series "DR" doors, but a clear window space exposes the top two tiers of the CAB-4 enclosure. Use an SBB-D4 backbox with the ADDR-D4. *See DN-7045, DN-6857.*

\*Use ADDR-B4/C4/D4 when CA-2 chassis is installed in top two rows with NCA-2 or BP-CA2. Use standard door when CA-2 is not installed in top two rows. For additional configuration information, see the DVC application guide on <http://esd.notifier.com>.

**DPA-1:** Dress panel, used with the CA-1 chassis when configured with a DVC-EM, DVC-KD, and CMIC-1. *See DN-7045.*

**DPA-2B:** Dress panel used with CA-2 chassis assembly.

**VP-2B:** Dress panel, required when CA-2 chassis is installed in the top two cabinet rows.

**DP-1A4:** Dress panel, used with the CA-1 chassis when the CMIC-1 is not used. Provides mounting options on right two bays for two ACS annunciators, or for blank plates. *See DN-7045.*

**BP-CA2:** Blank plate for CA-2 chassis.

**SEISKIT-CAB:** Seismic mounting kit. Required for seismic-certified applications with NFS2-640 and other equipment mounted in CAB-4 Series Enclosures. Includes battery bracket for two 26 AH batteries.

**SEISKIT-LBB:** Seismic kit for the NFS-LBB. Includes battery bracket for two 55 AH batteries.

## **BACKBOXES**

*NOTE: "C" suffix indicates ULC-Listed model.*

**ABF-1B(C)** Annunciator Flush Box.

**ABF-1DB(C)** Annunciator Flush Box with Door.

**ABF-2B** Annunciator Flush Box

**ABF-2DB/C** Annunciator Flush Box with Door

**ABF-4B** Annunciator Flush Box

**ABS-1TB(C)** Annunciator Surface Box

**ABS-1B(C)** Annunciator Surface Box

**ABS-2B** Annunciator Surface Box

**ABS-2D(C)** Annunciator Surface Box

**ABS-4D(C)** Annunciator Surface Box

**BB-UZC:** Backbox for housing the UZC-256 in applications where the UZC-256 will not fit in panel enclosure. Black; for red, order BB-UZC-R.

## **OTHER OPTIONS**

**411:** Slave digital alarm communicator. *See DN-6619.*

**411UDAC:** Digital alarm communicator. *See DN-6746.*

**IPDACT-2/2UD, IPDACT Internet Monitoring Module:** Connects to primary and secondary DACT telephone output ports for internet communications over customer-provided Ethernet connection. Requires compatible Teldat VisorALARM Central Station Receiver. Can use DHCP or static IP. *See DN-60408.*

**IPCHSKIT:** IP Communicator Chassis Mounting Kit. For mounting an IPDACT-2/2UD onto the panel chassis or CHS-4 series chassis. Use IPENC for external mounting applications.

**IPSPLT:** Y-adapter option allow connection of both panel dialer outputs to one IPDACT-2/2UD cable input.

**IPENC:** External enclosure for IPDACT, includes IPBRKT mounting bracket; Red. For Black order IPENC-B.

**IPGSM-4G:** Internet and Digital Cellular Fire Alarm Communicator. Provides selectable configurable paths: cellular only, IP only, or IP primary with cellular backup. Connects to the primary and secondary ports of a DACT. For Canadian applications order IPGSM-4GC. *See DH-60769.*

*NOTE: For other options including compatibility with retrofit equipment, refer to the panel's installation manual, the SLC manual, and the Device Compatibility Document.*

## System Specifications

### SYSTEM CAPACITY

- Intelligent Signaling Line Circuits ..... 1 expandable to 2
- Intelligent detectors ..... 159 per loop
- Addressable monitor/control modules ..... 159 per loop
- Programmable software zones ..... 99
- Special programming zones ..... 14
- LCD annunciators per CPU2-640/-640E and NCA-2 (*observe power*) ..... 32
- ACS annunciators per CPU2-640/-640E ..... 32 addresses x 64 points
- ACS annunciators per NCA-2 ..... 32 addresses x 64 or 96 points

**NOTE:** The NCA-2 supports up to 96 annunciator address points per ACM-24AT/-48A.

### ELECTRICAL SPECIFICATIONS

- Primary input power:
  - CPU2-640 board: 120 VAC, 50/60 Hz, 5.0 A.
  - CPU2-640E board: 220/240 VAC, 50/60 Hz, 2.5 A.
- Current draw (standby/alarm):
  - CPU2-640(E) board: 0.250 A. Add 0.035 A for each NAC in use.
  - KDM-R2: 0.100 A.
  - LEM-320: 0.100 A.
- Total output 24 V power: 6.0 A in alarm.

**NOTE:** The power supply has a total of 6.0 A. of available power. This is shared by all internal circuits. See Installation Manual for a complete current draw calculation sheet.

- Standard notification circuits (4): 1.5 A each.
- Resettable regulated 24V power: 1.25 A.
- Two non-resettable regulated 24V power outputs:
  - 1.25 A.
  - 0.50 A.
- Non-resettable 5V power: 0.15 A.
- Battery charger range: 18 AH – 200 AH. Use separate cabinet for batteries over 26 AH.
- Float rate: 27.6 V.

### CABINET SPECIFICATIONS

- Systems can be installed in CAB-4 Series cabinets (*four sizes with various door options, see DN-6857*). Requires BP2-4 Battery Plate.

### SHIPPING WEIGHT

- CPU2-640/-640: 14.3 lb (6.49 kg).
- CPU2-640/-640E: 14.55 lb (6.60 kg).

### TEMPERATURE AND HUMIDITY RANGES

This system meets NFPA requirements for operation at 0 – 49°C/ 32 – 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15 – 27°C/60 – 80°F.

### AGENCY LISTINGS AND APPROVALS

The listings and approvals below apply to the basic NFS2-640 control panel. In some cases, certain modules may not be listed by

certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL/ULC Listed:** S635.
- **ULC Listed:** S527-11
- **FM Approved.**
- **MEA:** 128-07-E.
- **Fire Dept. of New York:** #6212.
- **CSFM:** 7165-0028:0243.
- **City of Chicago.**
- **City and County of Denver.**
- **CCCF listed.**

**Marine Applications:** Marine approved systems must be configured using components itemized in this document. (See Main System Components, in "Product Line Information.") Specific connections and requirements for those components are described in the installation document, PN 54756. When these requirements are followed, systems are approved by the following agencies:

- **US Coast Guard** 161.002/50/0, 161.002/55/0 (Standard 46 CFR and 161.002).
- **Lloyd's Register** 11/600013 (ENV 3 category).
- **American Bureau of Shipping** (ABS) Type Approval.

**NOTE:** For information on marine applications, see DN-60688.

### STANDARDS

The NFS2-640 complies with the following UL Standards and NFPA 72, International Building Code (IBC), and California Building Code (CBC) Fire Alarm Systems requirements:

- **UL 864, 9th Edition** (Fire).
- **UL 1076** (Burglary).
- **UL 2572** (Mass Notification Systems). (NFS2-640 version 20 or higher.)
- **ULC-S527-11** Standard for the Installation of Fire Alarm Systems.
- **LOCAL** (Automatic, Manual, Waterflow and Sprinkler Supervisory).
- **AUXILIARY** (Automatic, Manual and Waterflow) (requires TM-4).
- **REMOTE STATION** (Automatic, Manual, Waterflow and Sprinkler Supervisory) (requires TM-4).
- **PROPRIETARY** (Automatic, Manual and Waterflow). *Not applicable for FM.*
- **EMERGENCY VOICE/ALARM.**
- **OT, PSDN** (Other Technologies, Packet-switched Data Network).
- **IBC 2012, IBC 2009, IBC 2006, IBC 2003, IBC 2000** (Seismic).
- **CBC 2007** (Seismic).

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This document is not intended to be used for installation purposes.  
We try to keep our product information up-to-date and accurate.  
We cannot cover all specific applications or anticipate all requirements.  
All specifications are subject to change without notice.



Country of Origin: USA

For more information, contact Notifier. Phone: (203) 484-7161, FAX: (203) 484-7118.  
www.notifier.com

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7165-0028:0243

Page 1 of 4

**CATEGORY:** 7165 -- FIRE ALARM CONTROL UNIT (COMMERCIAL)

**LISTEE:** NotifierOne Fire-Lite Place, Northford, CT 06472-1653  
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309  
Email: vladimir.kireyev@honeywell.com

**DESIGN:** Models NFS2-640, NFS-320/C (R), and NFS-320SYS fire alarm control units. Local, auxiliary, remote station (PPU), proprietary (PPU), central station (PPU), manual, automatic, waterfowl and sprinkler supervisory services. Also suitable for releasing service, Process Management and Emergency Voice/Alarm communication System \*. Model numbers may be followed by an "R" suffix representing the enclosure color being red. Refer to listee's data sheet for additional detailed product description and operational considerations. System components:

ACM-8R, -16AT, -32A, -24AT, -48A; Annunciator Control Modules  
ACPS-610, AMPS-24; Addressable power supply/charger  
ADP-4B, -A4, -1, -2, DP-DISP2; Dress Panel  
AEM-16AT, -32A, -24AT, -48A; Annunciator Expander Modules  
AFM-16A, -16AT, -32A; Annunciator Fixed Modules  
AKS-1B; Annunciator Key Switch  
APS2-6R; Power supply  
BB-100, -200, NFS-LBB/-LBBR; Battery Boxes  
BGRA-SCS, BGRB-SCS; Smoke Control Station  
BMP-1; Blank Module  
BP-4, BP2-4; Battery Dress Plates  
CAB-3/-4 Series; Enclosure  
CAB-RP, CAB-RPR; Cabinets  
CEF-SCS; Smoke Control Station  
CHS-4, CHS-4N, CHS-4L; Chassis  
CPU2-640, CPU-320SYS; CPU Board  
CRT-2; Display Terminal  
DP-1B; Blank Panel  
DPA-1A4/1/2, DP-DISP2; Dress Panel  
DPI-232; Panel Interface  
DR-A4, DR-A4B, DR-A4BR, DR-A4R; Door Assembly  
DR-AA4, DR-AA4B, DR-AA4BR, DR-AA4R; Door Assembly  
DR-B3F; Door Assembly  
DR-B4, DR-B4B, DR-B4BR, DR-B4R; Door Assembly  
DR-C4, DR-C4B, DR-C4BR, DR-C4R; Door Assembly  
DR-D4, DR-D4B, DR-D4BR, DR-D4R; Door Assembly

\*Rev. 10-29-13 gt



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Date Issued: **July 01, 2018**

Listing Expires **June 30, 2019**

Authorized By: **DAVID CASTILLO, Program Coordinator**  
*Fire Engineering Division*

EQ Series; Cabinets  
 EQBB-B4, EQBB-C4, EQBB-D4; Backbox Assembly  
 EQDR-B4, EQDR-C4, EQDR-D4; Door Assembly  
 FCM-1, FCM-1-REL; Releasing Control Module  
 FCPS-24S6, -24S8; Field Charger/Power Supply  
 FDM-1; Dual Monitor Module  
 FDRM-1:Multiple Module with two Relay Outputs  
 FDU-80/-80G; Remote Annunciator  
 FIRSTVISION-LCD/ENC; Interactive Firefighters' display/enclosure  
 FRM-1; Relay Module  
 FTM-1; Control Module  
 FZM-1, FMM-1, FMM-101; Monitor Modules  
 HS-NCM-W/-MF/-SF/-WMF/-WSF/-MSSF; High Speed Network Control Modules  
 IPDACT-2/-2UD; IP Fire Alarm Communicator  
 ISO-X; Isolator Module  
 KAPS-24, CPS-24; Power Supply  
 KDM-R2; Keyboard Display Module  
 LCD-80, -160; Annunciators  
 LCD-80TM; Annunciator Terminal Module LCD  
 LCD2-80; Remote Annunciator  
 LDM-32/-E32/-R32; Lamp Driver Module  
 LEM-320/ELEM-320; Loop Expander Module  
 NBG-12LRA; Agent Releasing Abort Station  
 NBG-12LX; Addressable Manual Pull Station  
 NCA, NCA-2; Network Communication Annunciator  
 NCM-W, -F; Network Control Module  
 NCS4-W-ONYX, NCS4-F-ONYX; Network Control Station  
 NCS5-W-ONYX, NCS5-F-ONYX; Network Control Station  
 NFS-LBB/NFS-LBBR; Battery Box/Red  
 NFS-320SYS; Chassis  
 NFV-25/50, NFV-25/50ZS/ZST; Voice Evacuation Control Panels  
 NFV-25/50DA, NFV-25/50DAZS; Distributed Audio Panels  
 ONYXWorks-EW/-NW/-NF/-HNW/-HNMF/-HNSF/-TS/-EW-TS/-NF-TS/-HW-TS/  
 -HNMF/-HNSF/-HNWT; PC workstation for NOTI●FIRE●NET, Wire/Fiber/  
 with Touch screen monitors  
 PRN-6; Printer  
 RKS-S; Remote Security Key Switch  
 RPT-W, -485W; Repeater Wire  
 RPT-F; Repeater Fiber  
 RPT -485FW; Repeater Fiber/Wire  
 RSA-SCS, RSB-SCS, RSC-SCS, RSD-SCS, RSE-SCS; Smoke Control Station  
 SBB-A3F; Backbox Assembly  
 SBB-A4, SBB-A4R, SBB-AA4, SBB-AA4R; Backbox Assembly  
 SBB-B4, SBB-B4R-L8, SBB-C4, SBB-C4R; Backbox Assembly  
 SBB-D4, SBB-D4R; Backbox Assembly

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SCE-8; Smoke Control Expander  
 SCS-8L; Smoke Control Lamp Driver Station  
 SCE-8L; Smoke Control Expander Lamp  
 SCS-8; Smoke Control Station  
 STS-1; Security Tamper Switch  
 TM-4; Transmitter Module  
 TR-A4/-B3N/-B4/-C4/-D3N/-D4; Trim Ring  
 UDACT, UDACT-2; Universal DACT  
 UZC-256; Universal Zone Coder  
 VP-2B; Dress Panel  
 XP5-C/-M; Transponder Modules  
 XP6-C; Supervised Control Modules  
 XP6-MA; Six Zone Interface Modules  
 XP6-R; Six Relay Control Modules  
 XP10-M(A); Ten Input Monitor Modules  
 XPM-8L; Transponder Monitor Modules

The following models are intended for use on NFS2-640 only:

AA-30, -100, -120; Amplifiers  
 ACT-1, -2, -4, -25, -70; Audio Coupling Transformer  
 ADDR-B4/-B4R/-C4/-C4R/-D4/-D4R; Door Assemblies  
 AMG-E; Audio Message Generator  
 AVL-1; Audio Voice Link  
 BDA-25V/-70V; Backup Digital Audio Amplifiers  
 CHS2-M2, CA-1, CA-2; Chassis  
 CMIC-1, CMIC-RP; Microphone Assembly  
 DAA-5025/-5070; Digital Audio Amplifiers  
 DAA-5025F/DAA-5025SF; Digital Audio Amplifiers  
 DAA-5070F/DAA-5070SF; Digital Audio Amplifiers, Fiber Mode  
 DAA-75 Series; Digital Audio Amplifiers  
 DAA-7525, DAA-7525F, DAA-7525SF; Digital Audio Amplifiers  
 DAA2-5025/-5070/-7525; Digital Audio Amplifiers  
 DAX-3525/-3570/-5025/-5070; Digital Audio Amplifiers  
 DS-AMP/E; Digital Series Audio Amplifier  
 DS-BDA; Digital Series Backup Amplifier  
 DS-DB; Digital Series Distribution Board  
 DS-FM, DS-RFM, DS-SFM; Digital Series Fiber Module  
 DVC; Digital Voice Command  
 DVC-EM/-EMF/-EMSF; Digital Voice Command Extended Memory Module  
 DVC-RPU; Remote Paging Unit  
 FFT-7, -7S; Fire Fighter's Telephone  
 FHS; Fireman's Handset  
 FPJ; Fireman's Phone Jack  
 RM-1, RM-1SA; Remote Microphone

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TELH-1; Telephone Assembly  
XPIQ; Transponder Quad Intelligent Audio

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, model number, electrical ratings, and UL Label

**APPROVAL:** Listed as fire alarm control units suitable for use in high-rise applications when used in conjunction with separately listed compatible initiating and indicating devices. \*Control units may be used with Notifier's First Command NFC-50/100 emergency voice evacuation panels (CSFM # 6911-0028:0265). This control unit can generate the temporal code pattern fire alarm signal as required per NFPA 72. Refer to manufacturer's Installation Manual for details. This control unit meets the requirements of UL Standard 864, 9th Edition.

**NOTE:**

1. For Fire Alarm Verification feature (delay of fire alarm signal), the maximum Retard/Reset/Restart period shall not exceed 30 Seconds.
2. Combined with 7170-028:244

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*Fire Engineering Division*

# NFC-50/100(E)

## Notifier First Command



### Voice Evacuation & Emergency Communications System

#### General

Notifier's First Command NFC-50/100 and NFC-50/100E are multipurpose emergency voice evacuation panels for fire applications, mass notification applications, or both. The First Command delivers 50 or 100 watts of audio power for distribution to up to eight speaker circuits (i.e. zones). The NFC-50/100(E) comes standard with a single speaker circuit and a built-in 50 watt, 25V amplifier. A secondary 50 watt amplifier (NFC-BDA-25/70V) can be added for single speaker circuit backup or to increase system capacity to two speaker circuits and an additional 50 watts of audio power. An optional NFC-CE6 module added to the NFC-50/100(E) will upgrade the system to a maximum of eight speaker circuit outputs. All speaker output circuits can be wired in either Style Y (Class B) or Style Z (Class A) configuration. The NFC-50/100(E) has fourteen field programmable messages (up to 60 seconds each), built-in field configurable pre- and post-announce tone generators and a fully supervised Notification Appliance Circuit (NAC) with 2.0 amps of synchronized NAC power. The NFC-50/100(E) includes three built-in Form-C relay contacts, (AC power, trouble and MNS active) a NAC follower and 500mA special application power. A built-in power supply delivers operational power and an onboard battery charger supports charging up to 26AH batteries (NFC cabinet holds up to 18AH batteries).

For fire protection applications, the NFC-50/100(E) is an adjunct (slave) to any UL listed FACP, providing reverse polarity or contact closure; can be used as a stand-alone unit for non-fire applications. For seamless integration between fire and mass notification, the NFC-50/100(E) can be directly activated via serial communication between the NFW2-100, NFS-320, or NFS2-640. Activation of the NFC-50/100(E) via other FACPs uses the eight on board Command Input Circuits (CMDs). Two of the eight CMD circuits (CMD 1 & CMD 2) can be individually field programmed for activation by an FACP Notification Appliance Circuit reverse polarity and all eight can be activated by a contact closure. In addition, the NFC-50/100(E) can be activated from a building's Private Branch Exchange (PBX) with the integral night ring feature.

All NFC-50/100(E) programming is done by using a simple, built-in programming utility accessed from any laptop. For added flexibility, the NFC-50/100(E) supports both 25V and 70V speaker output operation. By adding a 70V transformer conversion module (NFC-XRM-70V) or an additional 70 volt secondary amplifier (NFC-BDA-25/70V) the system supports 70 volt speaker devices.

The NFC-50/100(E) can expand in order to accommodate larger or more complex installations. To add more control and increase system capacity, any combination of up to eight external remote consoles (including the NFC-LOC, NFC-RPU, and NFC-RM) and up to eight distributed audio amplifiers (including the NFC-50DA(E), NFC-100DA(E) and NFC-125-DA(E) can be connected on the external data bus and audio riser data bus to create a fully integrated command center. A fully loaded system supports up to 1100 watts of total audio power and up to 24 speaker circuit outputs.



#### TYPICAL APPLICATIONS

- Schools
- Nursing Homes
- Factories
- Theaters
- Military facilities
- Restaurants
- Auditoriums
- Places of Worship
- Office Buildings

#### Features

- UL Listed to UL 2572 Communication (Control Units Mass Notification Systems) and UL 864 (emergency voice evacuation for fire)
- Modular design for system flexibility and easy expansion
- Removable terminal blocks
- 50 watts of 25V audio power (expandable to 100 watts) RMS
- 2 amp Notification Appliance Circuit (NAC) output, sync generator, or follower for System Sensor, Wheelock or Gen-tex protocols
- Optional 70V transformer available for the primary amplifier. (Note that speaker wiring continues to be supervised in standby, alarm and when background music is playing with this optional transformer installed)
- Eight Command Input Circuits to activate messages 1 to 8:
  - CMD1 and CMD2 are field selectable to be activated from 12 or 24 VDC Notification Appliance Circuits (reverse polarity) or contact closures
  - CMD3-CMD8 are activated by contact closures
- Speaker Circuits
  - Single Style Y (Class B) or Style Z (Class A) speaker Circuit

- Two Style Y (Class B) or Style Z (Class A) speaker circuits (with optional NFC-BDA-25/70V Audio Amplifier installed)
- Eight Style Y (Class B) or Style Z (Class A) speaker circuits (with optional NFC-BDA-25/70V and NFC-CE6 installed)
- 520Hz square wave tones available, which can be uploaded to the NFC-50/100 to meet NFPA Low Frequency requirements (*Refer to the Device Compatibility Document 15378 for listed compatible speakers.*)
- NFC-50/100(E) can be controlled by an FACP via the ANN/ACS (EIA-485) link of the NFW2-100, and via the ACS (EIA-485) link of the NFS-320 or NFS2-640. The NFS-320 or NFS2-640 must be firmware version 20.0 or higher.
- Certified for seismic applications when used with the appropriate seismic mounting kit
- Integral supervised microphone
- Microphone time-out feature which reverts back to prerecorded message if emergency page exceeds the programmed time
- 14 recorded messages
- Field-selectable message and custom message recording capability using the local microphone, a USB port, or an external audio input
- External Audio Input can be used for background music
- Up to 60 second message duration for all messages
- Integral tone generators field selectable for multiple tone types
- Powered by integral AC power supply or batteries during AC fail
- Programmable delay of immediate, 2 hours or 6 hours reporting of AC Loss
- Piezo sounder for local trouble
- 100 event history log
- Three Form-C relays:
  - AC Power Loss Relay - TB1
  - System Trouble Relay - TB2
  - MNS Active - TB3
- 500mA (0.5A) Special Application (auxiliary power) output for addressable modules when interfaced with compatible addressable FACP's and End-of-Line power supervision relays
- System Status LEDs (*Refer to "Controls and Indicators" in product manual LS10001-001NF-E.*)
- Integral Dress Panel
- Optional TR-CE-B semi-flush trim ring
- Any combination of up to eight (8) external remote consoles:
  - Optional NFC-RM Remote Microphone (includes cabinet) See DN-60778.
  - Optional NFC-RPU Remote Page Unit (includes cabinet) See DN-60775.
  - Optional NFC-LOC Local operator console (includes cabinet) See DN-60777.
- Any combination of up to eight (8) distributed audio amplifiers:
- Optional NFC-50DA(E) distributed amplifier, 50 watts. See DN-60776.
- Optional NFC-125DA(E) distributed amplifier, 125 watts. See DN-60776.
- Optional NFC-50/100 distributed amplifier with backup capability, 50/100 watts. See DN-60776.

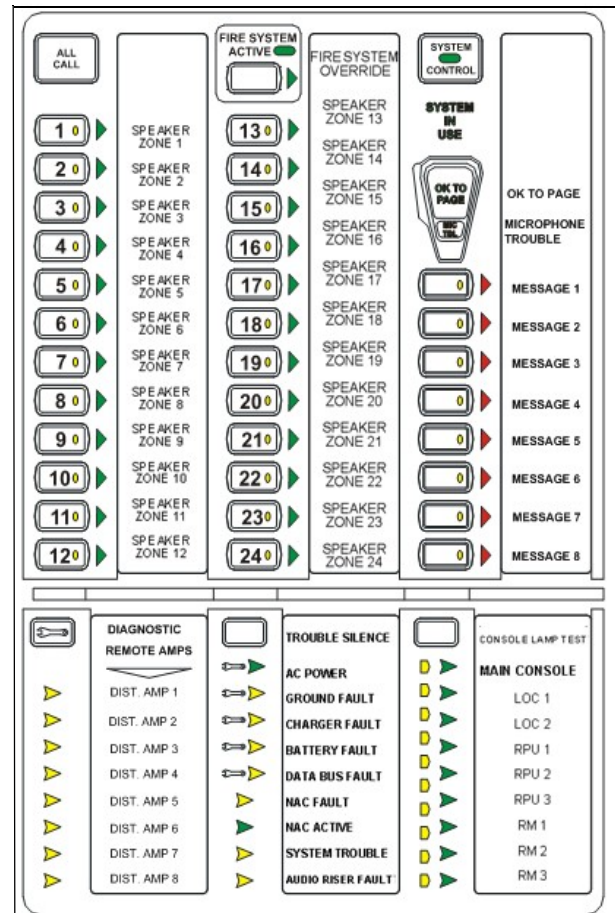
## Optional Internal Expansion Modules

**NFC-CE6:** Circuit Expander Module provides connections for up to six Style Z (Class A) or Style Y (Class B) speaker circuits. Circuits are configured through the web-based programming utility.

**NFC-BDA-25V:** 25V, 50 watt audio amplifier module. Adding a second speaker circuit increases the total NFC-50/100 power output to 100 watts or can also be used as a backup amplifier.

**NFC-BDA-70V:** 70V, 50 watt audio amplifier module. Adding a second speaker circuit increases the total NFC-50/100 power output to 100 watts or can also be used as a backup amplifier.

**NFC-XRM-70V:** 70V Transformer Conversion Module. Converts the NFC-50/100(E) primary amplifier to a 70V output. This transformer mounts directly to the NFC-50/100(E) main control board by two metal brackets.



## Control and Indicators

### PUSH BUTTON CONTROLS

- All Call
- MNS Control
- System Control
- Speaker Select 1-24
- Message Select 1-14
- Diagnostic Select
- Trouble Silence
- Console Lamp Test

## LED Status Indicators (visible with door closed)

Fire System Active (green)	LOC/RPU/RM 1-8 Active (green)
MNS Control (green)	Main Console Fault (yellow)
System Control (green)	AC Power (green)
System in Use (green)	Ground Fault (yellow)
Speaker Zone 1-24 Active (green)	Charger Fault (yellow)
Speaker Zone 1-24 Fault (yellow)	Battery Fault (yellow)
OK to Page (green)	Data Bus Fault (yellow)
Microphone Trouble (yellow)	NAC Fault (yellow)
Message 1-8 Active (red)	NAC Active (green)
Message 1-8 Fault (yellow)	System Trouble (yellow)
Remote Amplifier 1-8 Fault (yellow)	Audio Riser Fault (yellow)
LOC/RPU/RM 1-8 Fault (yellow)	

## LED Indicators (visible with door and dress panel open)

- Speaker Volume Control Fault (yellow).
- Option Card Fault (yellow).
- Amplifier Over Current Fault (yellow).

## Product Line Information

**NFC-50/100:** (Primary Operating Console) 50 Watt, 25V single speaker zone emergency voice evacuation system, integral microphone, built in tone generator and 14 recordable messages.

**NFC-50/100E:** Export version (Primary Operating Console) 50 Watt, 25V single speaker zone emergency voice evacuation system, integral microphone, built in tone generator and 14 recordable messages. (240 VAC, 50Hz).

**NFC-CE6:** Speaker Circuit/Zone Expander Module.

**NFC-BDA-25V:** 25V, 50 watt audio amplifier module. Adding a second speaker circuit increases the total NFC-50/100 power output to 100 watts or can also be used as a backup amplifier.

**NFC-BDA-70V:** 70V, 50 watt audio amplifier module. Adding a second speaker circuit increases the total NFC-50/100 power output to 100 watts or can also be used as a backup amplifier.

**NFC-XRM-70V:** 70V Transformer Conversion Module. Converts the NFC-50/100(E) primary amplifier to a 70V output. This transformer mounts directly to the NFC-50/100(E) main control board by two metal brackets.

**NFC-LOC:** Local Operator Console (Complete user interface), *Please refer to the data sheet DN-60777 for more information.*

**NFC-RPU:** Remote Page Unit Hand held microphone, 14 message buttons. *Please refer to the data sheet DN-60775 for more information.*

**NFC-RM:** Remote Microphone only. *Please refer to the data sheet DN-60778 for more information.*

**NFC-50DA:** Distributed (Remote) Audio Amplifier, 50 watts. *Please refer to the data sheet DN-60776 for more information.*

**NFC-50DAE:** Export version. Distributed (Remote) Audio Amplifier, 50 watts. (240 VAC, 50Hz). *Please refer to the data sheet DN-60776 for more information.*

**NFC-125DA:** Distributed (Remote) Audio Amplifier, 125 watts. *Please refer to the data sheet DN-60776 for more information.*

**NFC-125DAE:** Export version. Distributed (Remote) Audio Amplifier, 125 watts. (240 VAC, 50Hz). *Please refer to the data sheet DN-60776 for more information.*

**NFC-50/100DA:** Distributed (Remote) Audio Amplifier with back up, 50 watts/100 watts at 25Vrms or 70Vrms. *Please refer to the data sheet DN-60776 for more information.*

**NFC-50/100DAE:** Export version. Distributed (Remote) Audio Amplifier with back up, 50 watts/100 watts (240 VAC, 50Hz). *Please refer to the data sheet DN-60776 for more information.*

**NFC-BDA-BU:** Expander card for ECC-50BDA remote amplifier for 100 watt primary / 50 watt back up operation. *Please refer to the data sheet DN-60776 for more information.*

**NFC-CE4:** Distributed Audio Speaker Circuit/Zone expander module.

**NFC-FFT:** Fire Fighter Telephone System. *Please refer to the data sheet DN-60779 for more information.*

**NFC-RTZM:** Remote Telephone Zone Module. *Allows for secure access to the NFC via cell phone or remote telephone means; not UL listed. Please refer to the data sheet DN-60818 for more information.*

**SEISKIT-COMMENC:** Seismic kit for the NFC-50/100. Includes battery bracket for two 12 AH or 18 AH batteries.

**N-FPJ:** Remote Phone Jack.

**FHS-F:** Fire Fighters Remote Handset.

**FHSC-R:** Fire Fighters Handset Cabinet Recessed.

**FHSC-S:** Fire Fighters Handset Cabinet Surface Mount

**TR-CE-B:** Optional Trim Ring.

**THUMBLTCH:** Optional Thumb Latch. (Non UL-Listed).

**CHG-75:** 25 to 75 ampere-hours (AH) External Battery Charger.

**CHG-120:** 25-120 ampere-hours (AH) External Battery Charger.

**ECC-MICROPHONE:** Replacement Microphone only.

**BAT-1270:** Battery, 12 volt, 7.0 AH (Two required).

**BAT-12120:** Battery, 12 volt, 12.0 AH (Two required).

**BAT-12180:** Battery, 12 volt, 18.0 AH (Two required).

**BAT-12260:** Battery, 12 volt, 26.0 AH (Two required).

**BB-26:** Battery cabinet mounts up to two 26 AH batteries.

## Wiring Requirements

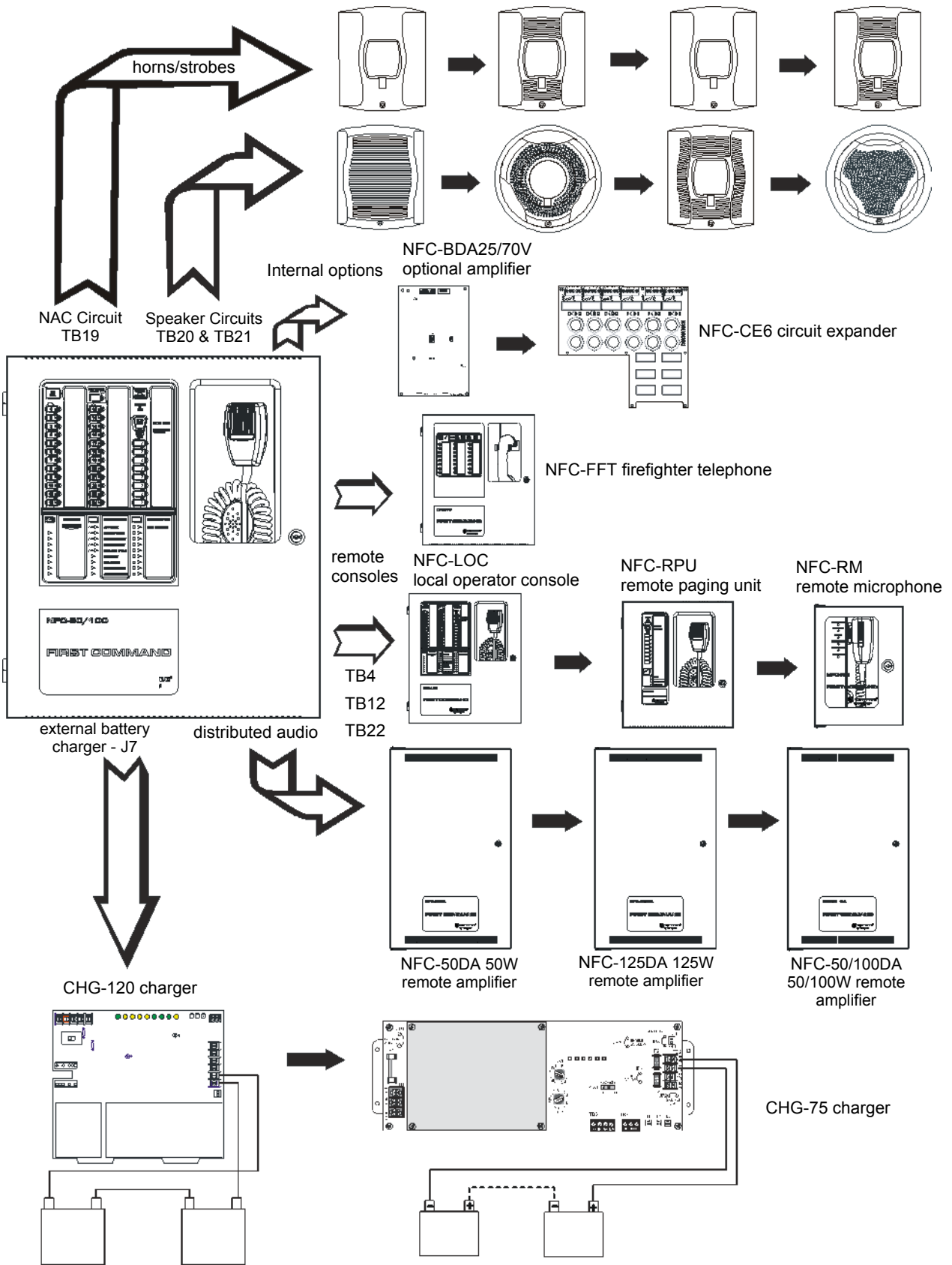
See product manual, part number LS10001-001NF-E for detailed wiring requirements.

## Total System Capacity: (NFC-50/100(E) only)

- Total Built-in Audio Power: 50 Watts.
- Total Expandable Audio Power: 100 Watts.
- Total Built-in Speaker Circuits: 2.
- Total Expandable Speaker Circuits: 8.
- Audio Message Max Time Duration: 60 seconds.
- External Audio Input: 1.

## Total System Capacity: (Fully Loaded System)

- Total Distributed Audio Power: 1100 Watts.
- Total Speaker Circuits Per System: 24.
- Total Remote Consoles Supported: 8.
- Total Distributed Audio Amplifiers Supported: 8.



**NFC-50/100(E) FirstCommand (Possible Configurations)**

## Electrical Specifications

### PRIMARY (AC) POWER (TB15)

**NFC-50/100:** 120 VAC, 60 Hz, 3.5 amps.

**NFC-50/100E:** 240 VAC, 50 Hz, 2.0 amps.

*Wire size: minimum #14 AWG (2.00mm<sup>2</sup>) with 600 V insulation.*

### SECONDARY POWER (BATTERY) CHARGING CIRCUIT (J7)

- Supports lead-acid batteries only.
- Float charge voltage at 27.3V
- Maximum charge current: 1.0 Amp
- Maximum battery charge capability: 2.8 Amps, 26AH (NFC cabinet holds max. 18AH battery).
- Minimum Battery size: 12 Amp Hour.

### AC LOSS RELAY CONTACT RATING (TB3)

- 2.0 amps @ 30 VDC (resistive), 0.5 amps @ 30 VAC (resistive).

### FORM C - TROUBLE RELAY CONTACT RATING (TB2)

- 2.0 amps @ 30 VDC (resistive), 0.5 amp @ 30 VAC (resistive).

### MNS ACTIVE RELAY CONTACT RATING (TB1)

- 2.0 amps @ 30 VDC (resistive), 0.5 amps @ 30 VAC (resistive).

### NOTIFICATION APPLIANCE CIRCUIT (NAC) OUTPUT RATING (TB19)

- One (1) Style Y (Class B) or Style Z (Class A) circuit.
- Power-limited circuitry, (Class 2) supervised.
- Nominal operating voltage: 24 VDC.
- Maximum signaling current for special application power: 2.0A.
- Maximum signaling current for regulated power: 200mA.
- Maximum wiring impedance: 1 $\Omega$ .
- Current limit: fuse-less, electronic, power-limited.
- End-Of-Line Resistor: 4.7 K $\Omega$ , ½ watt, (P/N 71252) required for Style Y (Class B) operation.

*Refer to the Device Compatibility Document 15378 for listed compatible devices.*

### NAC FOLLOWER OUTPUT REMOTE SYNC (TB18)

- Connections for FACP NAC synchronization trigger signal.
- Output terminals: pass-through to other system components.
- Trigger input voltage: 9 to 32 VDC, 24 VDC rated.
- Input current draw in Alarm condition: 10 mA at rated voltage.

### SPECIAL APPLICATION POWER (AUX. POWER) (TB17)

- 500 mA @ 24 VDC.
- Used for powering addressable modules and associated End-of-Line power supervision relays.

*Power-limited circuitry. Refer to the Device Compatibility Document 15378 for a list of compatible devices.*

### SPEAKER VOLUME CONTROL OVERRIDE (TB23)

- Style Y (Class B) or Style Z (Class A) circuit.
- Special application power.
- Power-limited circuitry, supervised.
- Nominal operating voltage: 24 VDC.
- Maximum signaling current: 0.25 amps.
- Current limit: fuse-less, electronic, power-limited.

- End-Of-Line Resistor: 4.7 K $\Omega$ , ½ watt, (P/N 71252) required for Style Y (Class B) operation.

## Speaker Circuits

- Primary Speaker Circuit (TB20)
- Secondary Speaker Circuit (TB21) (with optional amplifier only).
  - Circuit can be wired Style Y (Class B) or Style Z (Class A).
  - Power-limited circuitry.
  - Normal Operating Voltage: 25 VRMS @ 2 amps max and maximum Load Impedance of 12.5 $\Omega$  (70V @ 700 mA max. with maximum load Impedance of 100 $\Omega$  operation possible by plugging optional NFC-XRM-70V conversion transformer into J12 of the main control board).
  - Output Power: 50 watts (10 watts when background music is employed).
  - Frequency Range: 400Hz - 4,000Hz.
  - Maximum total capacitance for each speaker circuit: 250  $\mu$ F.
  - End-of-Line Resistor required for Style Y circuit: 15 K $\Omega$ , 1 watt (P/N: ELR-15K).

## Command Input Circuits (alarm polarities shown)

CMD1 - TB4 Terminals 3(+) & 4(-) are input terminals and Terminals 1(-) and 2(+) are output terminals which provide feed through of the NAC circuits to NAC devices down stream.

CMD2 - TB5 Terminals 3(+) & 4(-) are input terminals and Terminals 1(-) and 2(+) are output terminals which provide feed through of the NAC circuits to NAC devices downstream.

CMD3 - TB6 Terminals 1(+) & 2(-) are input terminals for contact closure only.

CMD4 - TB6 Terminals 3(+) & 4(-) are input terminals for contact closure only.

CMD5 - TB7 Terminals 1(+) & 2(-) are input terminals for contact closure only.

CMD6 - TB7 Terminals 3(+) & 4(-) are input terminals for contact closure only.

CMD7 - TB8 Terminals 1(+) & 2(-) are input terminals for contact closure only.

CMD8 - TB8 Terminals 3(+) & 4(-) are input terminals for contact closure only.

- Power-limited and supervised circuitry.
- Normal Operating Voltage Range: 10.5 VDC - 29 VDC; (Maximum Voltage: 29 VDC).
- NAC Reverse Polarity Current (requires End-of-Line Resistor from NAC): 1.6 mA maximum.
- Contact Closure Operation Current (requires 4.7K $\Omega$ , ½ watt End-of-Line Resistor P/N 27072): 6.6 mA maximum.
- Maximum Wiring Impedance CMD1 - CMD8 (Contact Closure Operation): 200 $\Omega$ .

**NOTE:** When the system is programmed for Mass Notification, CMD1 and CMD2 will be programmed for Reverse Polarity only. See manual P/N LS10001-001NF-E for more details.

### MAXIMUM INPUT IMPEDANCE:

- CMD1 & CMD2 (Reverse Polarity Operation): 20K $\Omega$ .
- CMD1 - CMD8 (Contact Closure Operation): 4.75K $\Omega$ .

### NIGHT RING INPUT - TB16, TERMINALS 1 (+) & 2 (-)

- Contact closure input.
- Isolated, non-supervised.
- Operation current: 3.8 mA, maximum.

- Maximum wiring impedance: 30K $\Omega$ .
- Minimum isolation withstand voltage: 1500 VRMS.

### **EXTERNAL OPERATOR INTERFACE POWER OUTPUT (TB24)**

- Non-resettable power for external operator interface components.
- Power-limited circuitry, non-supervised.
- Nominal operating voltage: 24 VDC.
- Maximum output current: 0.80 amps.
- Current limit: fuse-less, electronic, power-limited circuit.

### **EXTERNAL DATA BUS (EIA-485) (TB12)**

- Data connections for external operator interface components.
- Redundant transceiver circuitry for Class A operability.
- Power-limited circuitry, supervised.
- Maximum wiring impedance: 13.2 $\Omega$

### **FACP DATA BUS (EIA-485) (TB13)**

- Dedicated connection to FACP serial bus.
- Output terminals: pass-through to other system components.
- Isolated, supervised.
- Minimum isolation withstand voltage: 1500 VRMS.
- Maximum wiring impedance: 40 $\Omega$  (ANN-BUS), 26 $\Omega$  (ACS-BUS).
- External Audio Riser (TB22).
- Style Y (Class B) or Style Z (Class A) audio connections to external operator interface components.
- Power-limited circuitry, supervised.
- Audio signal level: 3.85 V, maximum.
- Frequency range: 400 Hz - 4 KHz RMS.
- Frequency range (NFC-50/125DA): 800Hz - 2KHz RMS.

### **EXTERNAL AUDIO INPUT (TB5)**

- Input Impedance: 8.5K $\Omega$  nominal @1KHz
- Input Voltage: 700 mV rms maximum
- Input Current: 0.1 mA maximum @ 700 mV

**NOTE:** Some laptops/personal computers only provide an audio output for headphones. It may be necessary to adjust the headphone output level for proper recording of voice messages.

## **NFC-CE6 Circuit Expander Module Specifications**

- Power-limited circuitry.
- Up to six (6) circuits on the NFC-CE6 can be wired as Style Y (Class B) or Style Z (Class A).
- Normal Operating Voltage for Speaker Circuits: 25 V @ 2.0 amps max. (Maximum Load Impedance of 12.5 $\Omega$ ).
- 70.0 V @ 700 mA max. with maximum Load Impedance of 100 $\Omega$  operation possible for the primary circuit by plugging in an optional NFC-XRM-70V conversion transformer into J12 of the main control board. The same operation is possible for the optional 50W amplifier by selecting the NFC-BDA-70V model.
- Speaker circuit wiring is supervised during standby, background music, and alarm.

- Output Power: 50 watts total; Frequency Range: 400Hz - 4,000Hz.
- Maximum total capacitance: 250  $\mu$ F. (Note that the total capacitance for the speaker outputs must not exceed the maximum of 250  $\mu$ F).
- End-of-Line Resistor required for Style Y (Class B) speaker circuit: 15 K $\Omega$ , 1 watt (P/N: ELR-15K) TB13 on the main control board: ACS/ANN (EIA-485) electrically isolated link to FACP provides programmed speaker control.

## **Cabinet Specifications**

- Backbox: 19.0"(48.26 cm) high x 16.65"(42.29 cm) wide x 5.20"(13.23 cm) deep.
- Door: 19.26" (48.92 cm) high x 16.82"(42.73 cm) wide x 0.12"(0.30 cm) deep.
- Trim Ring (TR-CE-B): 22.00" (55.88 cm) high x 19.65" (49.91 cm) wide.

## **Shipping Specifications**

Base Unit Weight: 27.85 lbs (12.63 kg).

## **Temperature and Humidity ranges**

This system meets NFPA requirements for operation at 0-49 $^{\circ}$  C/32-120 $^{\circ}$  F and at a relative humidity 93%  $\pm$  2% RH (non-condensing) at 32 $^{\circ}$  C  $\pm$  2 $^{\circ}$  C (90 $^{\circ}$  F  $\pm$  3 $^{\circ}$  F). However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and its peripherals be installed in an environment with a normal room temperature of 15-27 $^{\circ}$  C/60-80 $^{\circ}$  F.

## **Agency Listings and Approvals**

The listings and approvals below apply to the basic NFC-50/100(E) control panel. In some cases, certain modules may not be listed by certain approval agencies or listing may be in process. Consult factory for latest listing status.

- UL/ULC Listed S635.
- Compliant with UFC 4-021-01.
- CSFM: 6911-0028:0265.
- NYC Fire Dept. Certificate of Approval: #6163

## **Standards and Codes**

The NFC-50/100(E) complies with the following UL Standards, NFPA 72, International Building Codes, and California Building Codes.

- UL 864.
- UL 2572.
- IBC 2012, IBC 2009, IBC 2006, IBC 2003, IBC 2000 (Seismic).
- CBC 2007 (Seismic)

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We cannot cover all specific applications or anticipate all requirements.  
All specifications are subject to change without notice.



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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 6911-0028:0265 Page 1 of 1

**CATEGORY:** 6911 -- VOICE COMMUNICATION SYSTEMS CONTROL UNITS

**LISTEE:** NotifierOne Fire-Lite Place, Northford, CT 06472-1653  
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309  
Email: vladimir.kireyev@honeywell.com

**DESIGN:** Models NFC-50/100 and NFC-50/100E. These are 50-watt audio emergency voice evacuation panels expandable to 100-watt for fire applications, mass notification applications, or both. Refer to listee's data sheet for additional detailed product description and operational considerations. System components:  
\*ECC-LOC: Local Operator Console  
ECC-MCB; Main Control Board  
ECC-DKVC; Display Board  
NFC-BDA-25V; Amplifier Module 25 VRMS  
NFC-BDA-70V; Amplifier Module 70 VRMS  
NFC-CE6; Speaker Circuit Expander Module  
NFC-XRM-70V; Transformer Module 70.7 VRMS

**RATING:** Primary Operating: 120 V, 60 Hz, 3.5 A or 240 V, 50 Hz, 2 A

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, model number, electrical rating, and UL label.

**APPROVAL:** Listed as voice communication systems for use with separately listed compatible fire alarm control units to provide emergency voice evacuation signals. Refer to listee's Installation Instruction Manual for details.

**XLF:** 6911-0075:0226

\*12-27-2016 dc



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2018**

Listing Expires **June 30, 2019**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division



# FCPS-24S6(C/E) & FCPS-24S8(C/E)

## 6- & 8-Amp 24-Volt Remote Power Supplies



Power Supplies

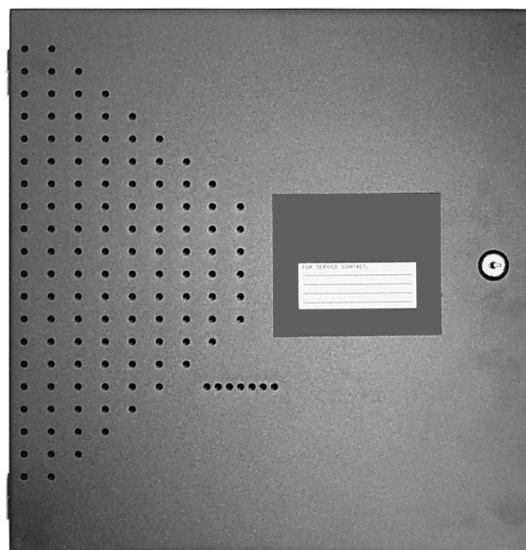
### General

The FCPS-24S6E (6-amp) and FCPS-24S8E (8-amp) are remote power supplies with battery charger. The FCPS-24S6/-24S8 may be connected to any 12 or 24 volt fire alarm control panel (FACP) or may be used as stand-alone supplies. Primary applications include notification appliance (bell) circuit (NAC) expansion (to support ADA requirements and NAC synchronization) or auxiliary power to support 24 volt system accessories. The FCPS-24S6/-24S8 provides regulated and filtered 24 VDC power to four notification appliance circuits configured as either four Class B (Style Y) or Class A (Style Z, with ZNAC-4 option module). Alternately, the four outputs may be configured as all non-resettable, all resettable or two non-resettable and two resettable. The FCPS-24S6/-24S8 also contains a battery charger capable of charging up to 18 AH batteries. FCPS-24S6C & FCPS-24S8C are ULC-listed.

**NOTE:** Unless otherwise specified, the terms FCPS-24S6 and FCPS-24S8 used in this document refers to the standard FCPS-24S6 and FCPS-24S8, FCPS-24S6C and FCPS-24S8C, the FCPS-24S6E and FCPS-24S8E

### Features

- UL-Listed NAC synchronization using System Sensor, Wheelock, or Gentex "Commander<sup>2</sup>" appliances.
- Operates as a "sync-follower" or as a "sync-generator" (default). See note on page 2.
- Contains two fully-isolated input/control circuits - triggered from FACP NAC (NAC expander mode) or jumped permanently "ON" (stand-alone mode).
- Four Class B (Style Y) or four Class A (Style Z, with ZNAC-4 module) NACs.
- 6-amp (FCPS-24S6) or 8-amp (FCPS-24S8) full load output, with 3 amps maximum/circuit, in NAC expander mode (UL 864).
- 4-amp (FCPS-24S6) or 6-amp (FCPS-24S8) continuous output in stand-alone mode (UL 1481).
- Compatible with coded inputs; signals passed through.
- Optional power-supervision relay (EOLR-1).
- In stand-alone mode, output power circuits may be configured as: resettable, (reset line from FACP required), non-resettable, or a mix of two and two.
- Fully regulated and filtered power output - optimal for powering four-wire smoke detectors, annunciators, and other system peripherals requiring regulated/filtered power.
- Power-limiting technology meets UL power-limiting requirements.
- Form-C normally-closed trouble relay.
- Fully supervised power supply, battery, and NACs.
- Selectable earth fault detection.
- AC trouble report selectable for immediate 2-hour delay.
- Works with virtually any UL 864 fire alarm control which utilizes an industry-standard reverse-polarity notification circuit (including unfiltered and unregulated bell power).
- Requires input trigger voltage of 9 - 32 VDC.
- Self-contained in compact, locking cabinet - 15"H x 14.5"W x 2.75"D (cm: 38.1H x 36.83W x 6.985D).



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- Includes integral battery charger capable of charging up to 18 AH batteries. Cabinet capable of housing 7.0 AH batteries.
- Battery charger may be disabled via DIP switch for applications requiring larger batteries.
- Fixed, clamp-type terminal blocks accommodate up to 12 AWG (3.1mm<sup>2</sup>) wire.

### Specifications

#### Primary (AC) Power:

- FCPS-24S6C/-24S8C: 120 VAC, 60 Hz, 3.2A maximum.
- FCPS-24S6E/-24S8E: 240 VAC, 50 Hz, 1.6A maximum.
- Wire Size: minimum #14 AWG (2.0mm<sup>2</sup>) with 600 V insulation.

#### Control Input Circuit:

- **Trigger Input Voltage:** 9 to 32 VDC.
- **Trigger Current:** 2.0 mA (16 - 32 V); Per Input: 1.0 mA (9 - 16 V).

#### Trouble Contact Rating: 5 A at 24 VDC.

**Auxiliary Power Output:** Specific application power 500 mA maximum.

#### Output Circuits:

- +24 VDC filtered, regulated.
- 3.0 A maximum for any one circuit.
- Total continuous current for all outputs (stand-alone mode):
  - FCPS-24S6: 4.0 A maximum.
  - FCPS-24S8: 6.0 A maximum.
- Total short-term current for all outputs (NAC expander mode):
  - FCPS-24S6: 6.0 A maximum.
  - FCPS-24S8: 8.0 A maximum.

#### Secondary Power (Battery) Charging Circuit:

- Supports lead-acid batteries only.
- Float-charge voltage: 27.6 VDC.

- Maximum current charge: 1.5 A.
- Maximum battery capacity: 18 AH.

## Applications

**Example 1:** Expand notification appliance power an additional 6.0 A (FCPS-24S6) or 8.0 A (FCPS-24S8). Use up to four Class B (Style Y) outputs or four Class A (Style Z) outputs (using ZNAC-4). For example, the FACP notification appliance circuits will activate the FCPS when reverse-polarity activation occurs. Trouble conditions on the FCPS are sensed by the FACP through the notification appliance circuit.

**Example 2:** Use the FCPS to expand auxiliary regulated 24-volt system power up to 4.0 A (FCPS-24S6) or up to 6.0 A (FCPS-24S8). Both resettable and non-resettable power options are available. Resettable outputs are created by connecting the resettable output from the FACP to one or both of the FCPS inputs.

**Example 3:** Use addressable control modules to activate the FCPS instead of activating it through the FACP notification appliance circuits. This typically allows for mounting the FCPS at greater distances\* away from the FACP while expanding system architecture in various applications.

For example, an addressable control module is used to activate the FCPS, and an addressable monitor module is used to sense FCPS trouble conditions. Local auxiliary power output from the FCPS provides power to the addressable control module.

*\*NOTE: Addressable FACP's are capable of locating control and monitor modules at distances of up to 12,500 feet (3,810 meters).*

## Sync Follower/Generator Note

In some installations, it is necessary to synchronize the flash timing of all strobes in the system for ADA compliance. Strobes accomplish this by monitoring very short timing pulses on the NAC power which are created by the FACP. When installed at the end of a NAC wire run, the FCPS-24S6/-24S8 can track (i.e. "follow") the strobe synchronization timing pulses on the existing NAC wire run. This maintains the overall system flash timing of the additional strobes attaches to the FCPS.

When the FCPS-24S6/-24S8 is configured (via DIP switch settings) as a "sync follower," the FCPS's NAC outputs track the strobe synchronization pulses present at the FCPS's sync input terminal. The pulses originate from an upstream FACP or other power supply.

When the FCPS-24S6/-24S8 are configured (via DIP switch settings) as a "sync generator," the FCPS's sync input terminals are not used. Rather, the FCPS is the originator of the strobe synchronization pulses on the FCPS's NAC outputs. In "sync generator" mode, the sync type (System Sensor, Wheelock, or Gentex) is selectable via DIP switch settings.

## Standards and Codes

The FCPS-24S6 and FCPS-24S8 comply with the following standards:

- **NFPA 72** National Fire Alarm Code.
- **UL 864** Standard for Control Units for Fire Alarm Systems (NAC expander mode).
- **UL 1481** Power Supplies for Fire Alarm Systems.

## Agency Listings and Approvals

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL Listed:** S635, S674
- **ULC Listed:** S635 (FCPS-24S6C & FCPS-24S8C)
- **CSFM Approved:** 7315-0028:225
- **MEA:** 299-02-E
- **FM Approved**

## Ordering Information

**FCPS-24S6:** 6.0 A, 120 VAC remote charger power supply. Includes main printed circuit board, transformers, enclosure (15"H x 14.5"W x 2.75"D [cm: 38.1H x 36.83W x 6.985D]), and installation instructions.

**FCPS-24S6C:** Same as above, ULC-listed.

**FCPS-24S6R:** Same as FCPS-24S6 with red enclosure.

**FCPS-24S6E:** 6.0 A, 240 VAC remote charger power supply. Includes main printed circuit board, transformers, enclosure (15"H x 14.5"W x 2.75"D [cm: 38.1H x 36.83W x 6.985D]), and installation instructions.

**FCPS-24S8:** 8.0 A, 120 VAC remote charger power supply. Includes main printed circuit board, transformers, enclosure (15"H x 14.5"W x 2.75"D [cm: 38.1H x 36.83W x 6.985D]), and installation instructions.

**FCPS-24S8C** Same as above, ULC-listed.

**FCPS-24S8R:** Same as FCPS-24S8 with red enclosure.

**FCPS-24S8E:** 8.0 A, 240 VAC remote charger power supply. Includes main printed circuit board, transformers, enclosure (15"H x 14.5"W x 2.75"D [cm: 38.1H x 36.83W x 6.985D]), and installation instructions.

**ZNAC-4:** Class A (Style Y) NAC option module.

**EOLR-1:** 12/24 VDC end-of-line relay for monitoring four-wire smoke detector power.

**BAT-1270:** Battery, 12-volt, 7.0 AH (two required, see BAT Series data sheet DN-6933).

**PS-1270:** Battery, 12-volt, 7.0 AH (two required, see PS Series data sheet DN-1109)

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OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7315-0028:0225 Page 1 of 1

**CATEGORY:** 7315 -- POWER UNITS

**LISTEE:** NotifierOne Fire-Lite Place, Northford, CT 06472-1653  
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309  
Email: vladimir.kireyev@honeywell.com

**DESIGN:** Models FCPS-24S6 and FCPS-24S8 are power limited power supply/battery chargers used for supervision and expanded power driving capability of up to four Notification Appliance Circuits (FACP Fire Circuits, Signaling Devices) or resettable/non resettable outputs. Model ZNAC-4 Class A converter. Refer to listee's data sheet for additional detailed product description and operational considerations.

**RATING:** 120 VAC, 24 VDC

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, model number, electrical rating and UL label.

**APPROVAL:** Listed as a Power Supply/Battery Charger for use with separately listed compatible fire alarm control units.

**XLF:** 7315-0075:0206

1-24-03KK



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2018**

Listing Expires **June 30, 2019**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division

# NBG-12 Series

## Non-Coded Conventional Manual Fire Alarm Pull Stations



Conventional Initiating Devices

### General

The NOTIFIER **NBG-12 Series** is a cost-effective, feature-packed series of non-coded manual fire alarm pull stations. It was designed to meet multiple applications with the installer and end-user in mind. The NBG-12 Series features a variety of models including single- and dual-action versions.

The NBG-12 Series provides an alarm initiating input signal to conventional fire alarm control panels (FACPs) such as the SFP Series, and to XP Transponders. Its innovative design, durable construction, and multiple mounting options make the NBG-12 Series simple to install, maintain, and operate.

### Features

- Aesthetically pleasing, highly visible design and color.
- Attractive contoured shape and light textured finish.
- Meets ADA 5 lb. maximum pull-force.
- Meets UL 38, Standard for Manually Actuated Signaling Boxes.
- Easily operated (single- or dual-action, model dependent), yet designed to prevent false alarms when bumped, shaken, or jarred.
- PUSH IN/PULL DOWN handle latches in the down position to clearly indicate the station has been operated.
- The word "ACTIVATED" appears on top of the handle in bright yellow, further indicating operation of the station.
- Operation handle features white arrows showing basic operation direction for non-English-speaking persons.
- Braille text included on finger-hold area of operation handle and across top of handle.
- Multiple hex- and key-lock models available.
- U.S. patented hex-lock needs only a quarter-turn to lock/unlock.
- Station can be opened for inspection and maintenance without initiating an alarm.
- Product ID label viewable by simply opening the cover; label is made of a durable long-life material.
- The words "NORMAL" and "ACTIVATED" are molded into the plastic adjacent to the alarm switch (located inside).
- Four-position terminal strip molded into backplate.
- Terminal strip includes Phillips combination-head captive 8/32 screws for easy connection to Initiating Device Circuit (IDC).
- Terminal screws backed-out at factory and shipped ready to accept field wiring (up to 12 AWG/3.1 mm<sup>2</sup>).
- Terminal numbers are molded into the backplate, eliminating the need for labels.
- Switch contacts are normally open.
- Can be surface-mounted (with **SB-10** or **SB-I/O**) or semi-flush mounted. Semi-flush mount to a standard single-gang, double-gang, or 4" (10.16 cm) square electrical box.
- Backplate is large enough to overlap a single-gang backbox cutout by 1/2" (1.27 cm).
- Optional trim ring (**BG12TR**).
- Spanish versions (*FUEGO*) available (**NBG-12LSP**, **NBG-12LPSP**).
- Designed to replace the legacy **NBG-10** Series.
- Models packaged in attractive, clear plastic (PVC), clam-shell-style, Point-of-Purchase packages. Packaging includes a cutaway dust/paint cover in shape of pull station.



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### Construction

- Cover, backplate and operation handle are all molded of durable polycarbonate material.
- Cover features white lettering and trim.
- Red color matches System Sensor's popular SpectrAlert® Advance horn/strobe series.

### Operation

The NBG-12 manual pull stations provide a textured finger-hold area that includes Braille text. In addition to PUSH IN and PULL DOWN text, there are arrows indicating how to operate the station, provided for non-English-speaking people.

Pushing in and then pulling down on the handle activates the normally-open alarm switch. Once latched in the down position, the word "ACTIVATED" appears at the top in bright yellow, with a portion of the handle protruding at the bottom as a visible flag. Resetting the station is simple: insert the key or hex (model dependent), twist one quarter-turn, then open the station's front cover, causing the spring-loaded operation handle to return to its original position. The alarm switch can then be reset to its normal (non-alarm) position manually (by hand) or by closing the station's front cover, which automatically resets the switch.

### Specifications

#### PHYSICAL SPECIFICATIONS:

	pull station	SB-10	SB-I/O	WBB	WP-10
H	5.500 in. (13.97 cm)	5.500 in. (13.97 cm)	5.601 in. (14.23 cm)	4.25 in. (10.79 cm)	6.000 in. (15.24 cm)
W	4.121 in. (10.467 cm)	4.125 in. (10.478 cm)	4.222 in. (10.72 cm)	4.25 in. (10.79 cm)	4.690 in. (11.913 cm)
D	1.390 in. (3.531 cm)	1.375 in. (3.493 cm)	1.439 in. (3.66 cm)	1.75 in. (4.445 cm)	2.000 in. (5.08 cm)

6643dim2.tbl

#### ELECTRICAL SPECIFICATIONS:

**Switch contact ratings:** gold-plated; rating 0.25 A @ 30 VAC or VDC. **Auxiliary contact circuit** (Terminals 3 & 4, NBG-12LA): rated to 3.0 A @ 30 VAC or VDC.

## ENGINEERING/ARCHITECTURAL SPECIFICATIONS

Manual Fire Alarm Stations shall be non-code, with a key- or hex-operated reset lock in order that they may be tested, and so designed that after actual Emergency Operation, they cannot be restored to normal except by use of a key or hex. An operated station shall automatically condition itself so as to be visually detected as activated. Manual stations shall be constructed of red colored LEXAN (or polycarbonate equivalent) with clearly visible operating instructions provided on the cover. The word **FIRE** shall appear on the front of the stations in white letters, 1.00 inches (2.54 cm) or larger.\* Stations shall be suitable for surface mounting on matching backbox SB-10 or SB-I/O; or semi-flush mounting on a standard single-gang, double-gang, or 4" (10.16 cm) square electrical box, and shall be installed within the limits defined by the Americans with Disabilities Act (ADA) or per national/local requirements. Manual Stations shall be Underwriters Laboratories listed.

**NOTE:** \*The words "FIRE/FUEGO" on the NBG-12LSP and NBG-12LPSP shall appear on the front of the station in white letters, approximately 3/4" (1.905 cm) high.

## Pre-Signal Models

The NBG-12LPS and NBG-12LPSP pull stations are non-coded manual pull stations which provide a FACP with two normally open alarm initiating input signals. "Pre-signal" input is activated by pushing in, then pulling down, the dual-action handle. A "general" alarm input signal can be manually activated via a momentary rocker switch mounted inside the unit. This general alarm switch can only be accessed by opening the cover with the supplied key/lock. See diagram at right.

## Agency Listings and Approvals

The listings and approvals below apply to the NBG-12 Series pull stations. In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **C(UL)US** Listed: file S692.
- **CSFM** approved: file 7150-0028:199.
- **FM** approved (except NBG-12LPS, NBG-12LPSP).
- **MEA** approved: file 67-02-E (NBG-12, NBG-12L, NBG-12LOB, NBG-12LA).
- **Lloyd's Register** type approved: file 93/60141 (E3) (NBG-12, NBG-12L, NBG-12LA, NBG-12LOB, NBG-12S).
- **U.S. Coast Guard** approved: files 161.002/23/3 (AFP-200 with NBG-12, NBG-12L, NBG-12S); 161.002/42/1 (NFS-640 with NBG-12, NBG-12L, NBG-12S); 161.002/27/3 (AFP1010/AM2020 with NBG-12, NBG-12L, NBG-12S).
- **Patented:** U.S. Patent No. D428,351; 6,380,846; 6,314,772; 6,632,108.

## Product Line Information

**NBG-12S:** Single-action pull station with pigtail connections, hex lock.

**NBG-12:** Dual-action pull station with SPST N/O switch, screw terminal connections, **hex lock**.

**NBG-12L:** Dual-action pull station with SPST N/O switch, screw terminal connections, **key lock**.

**NBG-12LSP:** Same as NBG-12L with English/Spanish (FIRE/FUEGO) labeling.

**NBG-12LPS:** Dual-action pull station with pre-signal option.

**NBG-12LPSP:** Same as NBG-12LPS with English/Spanish (FIRE/FUEGO) labeling.

**NBG-12LOB:** Dual-action pull station with key lock, outdoor applications listings (NBG-12LO), and backbox. Includes SB-I/O indoor/outdoor backbox, and sealing gasket. Model will also mount to WP-10 weatherproof backbox in retrofit applications.

**NOTE:** NBG-12LO not available separately;

NBG-12LO + approved backbox = NBG-12LOB.

Outdoor applications listings apply to NBG-12LOB combination.

**NBG-12LA:** Dual-action pull station with key lock and annunciator contacts.

**SB-10:** Surface-mount backbox, metal.

**SB-I/O:** Surface-mount backbox, plastic. (Included with NBG-12LOB.)

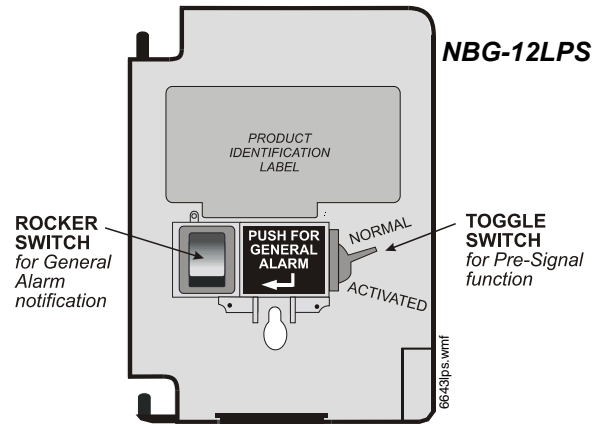
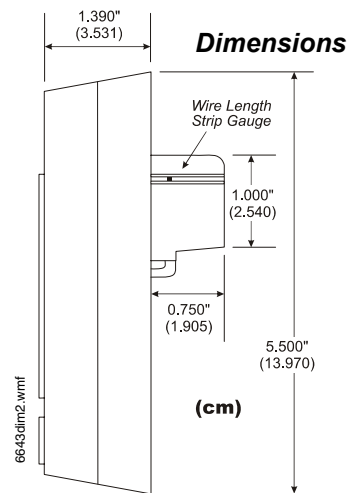
**BG12TR:** Optional trim ring for semi-flush mounting.

**WP-10:** Outdoor use backbox.

**17021:** Keys, set of two. (Included with key-lock pull stations.)

**17007:** Hex key, 9/64". (Included with hex-lock pull stations.)

**NOTE:** For addressable NBG-12LX models, see data sheet DN-6726.



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We cannot cover all specific applications or anticipate all requirements.  
All specifications are subject to change without notice.



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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7150-0028:0199

Page 1 of 1

**CATEGORY:** 7150 -- FIRE ALARM PULL BOXES

**LISTEE:** NotifierOne Fire-Lite Place, Northford, CT 06472-1653  
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309  
Email: vladimir.kireyev@honeywell.com

**DESIGN:** Models NBG-12, NBG-12S, NBG-12LR, NBG-12LRA, NBG-12LAO, NBG-12LAOB, NBG-12-LO, NBG-12LOB, NBG-12W, NBG-12LW, NBG-12NC, NBG-12WP, NBG-12LWP, NBG-12L, NBG-12LX, NBG-12LA, NBG-12PS, NBG-12LSP, NBG-12LPS, NBG-12LPSP, NBG-12SP, NOT-BG12LX, NBG-12LXSP, NBG-12LXBL and NBG-12LXP fire alarm pull boxes. All units except Model NBG-12S are dual action pull stations. Models NBG-12LR and NBG-12LRA are intended for agent releasing device. Refer to listee's data sheet for detailed product description and operational considerations.

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, model number, rating, and UL label.

**APPROVAL:** Listed as fire alarm pull boxes for use with separately listed compatible fire alarm control units. Models NBG-12WP, NBG-12LW, NBG-12W, NBG-12LWP, NBG-12LAO, NBG-12LO, NBG-12LAOB and NBG-12LOB are intended for outdoor use when installed with Models WBB, SB-I/O, or WP-10 back box. Refer to listee's Installation Instruction Manual for details.

These manual pull boxes meet the requirements of UL Standard 38, 1999 Edition and California amendments which the controls and operating mechanisms required to be operable at no more than 5lbs. force with one hand and shall not require tight grasping, pinching, or twisting of the wrist.

\*Corrected 10-08-12 bh



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2017**

Listing Expires **June 30, 2018**

Authorized By: **DAVID CASTILLO, Program Coordinator**  
*Fire Engineering Division*

# FSP-851(A) Series

## Intelligent Plug-In Photoelectric Smoke Detectors with FlashScan®



Intelligent/Addressable Devices

### General

Notifier FSP-851(A) Series intelligent plug-in smoke detectors with integral communication provide features that surpass conventional detectors. Detector sensitivity can be programmed in the control panel software. Sensitivity is continuously monitored and reported to the panel. Point ID capability allows each detector's address to be set with rotary, decimal address switches, providing exact detector location for selective maintenance when chamber contamination reaches an unacceptable level. The FSP-851(A) photoelectric detector's unique optical sensing chamber is engineered to sense smoke produced by a wide range of combustion sources. Dual electronic thermistors add 135°F (57°C) fixed-temperature thermal sensing on the FSP-851T(A). The FSP-851R(A) is a remote test capable detector for use with DNR(A)/DNRW duct detector housings. FSP-851(A) series detectors are compatible with Notifier Onyx and CLIP series Fire Alarm Control Panels (FACPs).

**FlashScan®** (U.S. Patent 5,539,389) is a communication protocol developed by Notifier that greatly increases the speed of communication between analog intelligent devices. Intelligent devices communicate in a grouped fashion. If one of the devices in the group has new information, the panel's CPU stops the group poll and concentrates on single points. The net effect is response speed greater than five times that of earlier designs.

### Features

- Sleek, low-profile design.
- Addressable-analog communication.
- Stable communication technique with noise immunity.
- Low standby current.
- Two-wire SLC connection.
- Compatible with FlashScan® and CLIP protocol systems.
- Rotary, decimal addressing (1-99 on CLIP systems, 1-159 on FlashScan systems).
- Optional remote, single-gang LED accessory.
- Dual LED design provides 360° viewing angle.
- Visible bi-color LEDs blink green every time the detector is addressed, and illuminate steady red on alarm (*FlashScan systems only*).
- Remote test feature from the panel.
- Walk test with address display (an address on 121 will blink the detector LED: 12-[pause]-1 (*FlashScan systems only*)).
- Built-in functional test switch activated by external magnet.
- Built-in tamper-resistant feature.
- Sealed against back pressure.
- Constructed of off-white fire-resistant plastic, designed to commercial standards, and offers an attractive appearance.
- 94-5V plastic flammability rating.
- SEMS screws for wiring of the separate base.
- Optional relay, isolator, and sounder bases.



FSP-851(A) in B210LP(A) Base

B210-2951.jpg

### Specifications

**Sensitivity:** 0.5% to 2.35% per foot obscuration

**Size:** 2.1" (5.3 cm) high; base determines diameter.

- **B210LP(A):** 6.1" (15.5 cm) diameter.
- **B501(A):** 4.1" (10.4 cm) diameter.
- **B200S(A):** 6.875" (17.46 cm) diameter.
- **B200SR(A):** 6.875" (17.46 cm) diameter.
- **B224RB(A):** 6.2" (15.748 cm) diameter.
- **B224BI(A):** 6.2" (15.748 cm) diameter.

**Shipping Weight:** 5.2oz. (147g).

**Operating Temperature range:** FSP-851(A), 0°C to 49°C (32°F to 120°F). FSP-851T(A), 0°C to 38°C (32°F to 100°F). Low temperature signal for FSP-851T(A) at 45°F +/- 10°F (7.22°C +/- 5.54°C). FSP-851R(A) installed in a DNR(A)/DNRW, -20°C to 70°C (-4°F to 158°F).

**UL/ULC Listed Velocity Range:** 0-4000 ft/min. (1219.2 m/min.), suitable for installation in ducts.

**Relative Humidity:** 10%-93% noncondensing.

**Thermal Ratings:** Fixed-temperature setpoint 135°F (57°C).

#### DETECTOR SPACING AND APPLICATIONS

Notifier recommends spacing detectors in compliance with NFPA 72. In low airflow applications with smooth ceiling, space detectors 30 feet (9.144m) for ceiling heights 10 feet (3.148m) and higher. For specific information regarding detector spacing, placement, and special applications refer to NFPA 72. *System Smoke Detector Application Guide*, document A05-1003, is available at [systemsensor.com](http://systemsensor.com)

#### ELECTRICAL SPECIFICATIONS

**Voltage Range:** 15-32 volts DC peak.

**Standby Current (max. avg.):** 300µA @ 24VDC (one communication every five seconds with LED enabled).

**LED Current (max.):** 6.5mA @ 24 VDC ("ON").

## Installation

FSP-851(A) plug-in detectors use a separate base to simplify installation, service, and maintenance. A special tool allows maintenance personnel to plug in and remove detectors without using a ladder.

Mount base (all base types) on an electrical backbox which is at least 1.5" (3.81 cm) deep. For a chart of compatible junction boxes, see *DN-60054*.

**NOTE:** 1) Because of inherent supervision provided by the SLC loop, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring. 2) When using relay or sounder bases, consult the ISO-X(A) installation sheet I56-1380 for device limitations between isolator modules and isolator bases.

## Agency Listings and Approvals

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL Listed:** S1115.
- **ULC Listed:** S1115 (FSP-851A, FSP-851RA, FSP-851TA).
- **MEA Listed:** 225-02-E .
- **FM Approved.**
- **CSFM:** 7272-0028:0206 .
- **Maryland State Fire Marshal:** Permit # 2122 .
- **BSMI:** CI313066760036.
- **CCCF:** Certif. # 2004081801000017 (FSP-851T)  
Certif. # 2004081801000016 (FSP-851).
- **U.S. Coast Guard:** 161.002/42/1 (NFS-640); 161.002/50/0 (NFS2-640/NFS-320/NFS-320C, excluding B210LP(A)).
- **Lloyd's Register:** 11/600013 (NFS2-640/NFS-320/NFS-320C, excluding B210LP(A)).

## Product Line Information

**NOTE:** "A" suffix indicates ULC Listed model.

**FSP-851:** Low-profile intelligent photoelectric sensor. Must be mounted to one of the bases listed below.

**FSP-851A:** Same as FSP-851 but with ULC listing.

**FSP-851T:** Same as FSP-851 but includes a built-in 135°F (57°C) fixed-temperature thermal device.

**FSP-851TA:** Same as FSP-851T but with ULC listing.

**FSP-851R:** Low-profile intelligent photoelectric sensor, remote test capable. For use with DNRA/DNRW.

**FSP-851RA:** Same as FSP-851R but with ULC listing. For use with DNRA.

### INTELLIGENT BASES

**NOTE:** "A" suffix indicates ULC Listed model.

**NOTE:** For details on intelligent bases, see *DN-60054*.

**B210LP(A):** Standard U.S. flanged low-profile mounting base.

**B210LPBP:** Bulk pack of B210LP; package contains 10.

**B501(A):** Standard European flangeless mounting base.

**B501BP:** Bulk pack of B501; package contains 10.

**B200S(A):** Intelligent, programmable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone.

**B200SR(A):** Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Replaces B501BH series bases in retrofit applications.

**B224RB(A):** Plug-in System Sensor **relay** base. Screw terminals: up to 14 AWG (2.0 mm<sup>2</sup>). Relay type: Form-C. Rating: 2.0 A @ 30 VDC resistive; 0.3 A @ 110 VDC inductive; 1.0 A @ 30 VDC inductive.

**B224BI(A):** Plug-in System Sensor **isolator** detector base. Maximum 25 devices between isolator bases.

### ACCESSORIES

**F110:** Retrofit flange to convert B210LP(A) to match the B710LP(A) profile, or to convert older high-profile bases to low-profile.

**F110BP:** Bulk pack of F110; package contains 15.

**F210:** Replacement flange for B210LP(A) base.

**RA100Z(A):** Remote LED annunciator. 3 – 32 VDC. Mounts to a U.S. single-gang electrical box. For use with B501(A) and B210LP(A) bases only.

**SMB600:** Surface mounting kit

**M02-04-00:** Test magnet.

**M02-09-00:** Test magnet with telescoping handle.

**XR2B:** Detector removal tool. Allows installation and/or removal of detector heads from bases in high ceiling applications.

**XP-4:** Extension pole for XR2B. Comes in three 5-foot (1.524 m) sections.

**T55-127-010:** Detector removal tool without pole.

**BCK-200B:** Black detector covers for use with FSP-851(A) only; box of 10.

**WCK-200B:** White detector covers for use with FSP-851(A) only; box of 10.

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FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7272-0028:0206 Page 1 of 1

**CATEGORY:** 7272 -- SMOKE DETECTOR-SYSTEM TYPE-PHOTOELECTRIC

**LISTEE:** NotifierOne Fire-Lite Place, Northford, CT 06472-1653  
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309  
Email: vladimir.kireyev@honeywell.com

**DESIGN:** Models FSP-751, HPX-751, FSP-751T, FSH-751, FAPT-751, FAPT-851, FSP-851, FSP-851R\* and FSP-851T photoelectric type smoke detectors. Models FSP-751T and FSP-851T employ a 135°F supplement integral heat sensor which only assists in a fire situation. This thermal circuitry is NOT approved for use in lieu of a required heat detector. Refer to listee's data sheet for additional detailed product description and operational considerations.

**RATING:** 24 VDC

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes & ordinances and in manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, product number, electrical rating and UL label.

**APPROVAL:** Listed as photoelectric type smoke detector for use with listee's separately listed compatible base and fire alarm control units. Models FSP-751, FSP-751T, FAPT-751, FAPT-851, FSP-851, FSP-851R\*, FSP-851T are suitable for open areas and inside duct installation with air velocities between 0-4000 fpm. Model HPX-751 is suitable for open areas with air velocities between 0-300 fpm. Model FSH-751 is suitable for open areas with air velocity between 0-4000 fpm.

**NOTE:** Combined with 7272-0028:208

The photoelectric type detectors are generally more effective at detecting slow, smoldering fires that smolder for hours before bursting into flame. Sources of these fires may include cigarettes burning in couches or bedding. The ionization type detectors are generally more effective at detecting fast, flaming fires that consume combustible materials rapidly and spread quickly. Sources of these fires may include paper burning in a waste container or a grease fire in the kitchen.

\*Rev. 01-07-2009 fm



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2018**

Listing Expires **June 30, 2019**

Authorized By: **DAVID CASTILLO, Program Coordinator**  
*Fire Engineering Division*

# FSC-851(A) IntelliQuad™

## Advanced Multi-Criteria Detector with four unique sensing elements



Intelligent / Addressable Devices

### General

This latest addition to Notifier's Advanced Detection line combines four complementary technologies into one device to convey accurate fire sensing information for locations where absolute certainty is required.

It is designed for use with Notifier's ONYX series fire alarm control panels (FACPs).

### Features

- Unique ability to detect all four major elements of a fire
- Highest nuisance alarm immunity
- Advanced algorithms interpret and respond to the multiple inputs
- Six levels of sensitivity
- CO sensing for fastest response to slow developing, smoldering fires
- Fully integrated infrared sensing to support the fire alarm decision
- Automatic drift compensation of smoke sensor and CO cell
- Superior EMI protection
- Twin LED indicators providing 360° visibility
- LEDs can be panel controlled to blink, latch on, latch off
- Built-in test switch

This plug-in fire detector combines four separate sensing elements in one unit:

1. Electrochemical cell technology that monitors carbon monoxide (CO) produced by smoldering fires
2. Infrared (IR) sensing that measures ambient light levels and flame signatures
3. Photo-electric smoke detection
4. Thermal detection for temperature monitoring

The integration of continual monitoring for all four major elements of a fire has enabled Notifier to create a detector that responds more quickly to an actual fire with the highest immunity to nuisances. This advanced multi-criteria detector operates at a high immunity level, changing to become very sensitive to identify those that should be ignored, reducing false alarms.

Its on-board intelligence runs advanced algorithms that dynamically adjust detection parameters to respond to the inputs from the sensors, enabling instant response as ambient conditions change.

The program changes sensor thresholds, sensor gain, time, delays, combinations, sampling rates, and averaging rates. If any sensor fails, the detector automatically adjusts the sensitivity of the remaining sensors. It also recognizes a fault condition.

The CO cell has an expected lifetime of approximately six years. It is not a field replaceable component. An internal timer signals the control panel to indicate the approach of the CO cell's end of life. Upon expiration, you should contact the system supplier to arrange for replacement of the unit. Detection is not compromised when the CO cell expires. The algorithms automatically adjust to properly weight the inputs from the photo-electric, heat, and IR sensors.



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**NOTE:** The CO cell is specifically deployed as a component of smoke detection in this device. This device is not listed for applications in which standalone CO detection is required for life safety.

The IR light sensor recognizes specific situations such as welding and makes adjustments rapidly to further reduce the potential for nuisance alarms. The thermal detection function uses thermistor technology with a software-corrected linear temperature response to offer exceptional nuisance alarm immunity and excellent fire detection.

### Product Line Information

**FSC-851:** IntelliQuad Advanced Multi-Criteria Detector

**FSC-851A:** ULC-listed version

#### Accessories

**B710LP:** Flanged mounting base. 6.1" (15.5 cm) diameter.

**B710LPA:** Flanged mounting base, ULC Listed.

**B710LPBP:** Flanged mounting base. (Pack of 10)

**B200S:** Intelligent sounder base, capable of producing a variety of tone patterns including ANSI Temporal 3. Compatible with System Sensor synchronization protocol.

**B200SA:** Intelligent sounder base, capable of producing a variety of tone patterns including ANSI Temporal 3. Compatible with System Sensor synchronization protocol, ULC-listed.

**B200SR:** Intelligent sounder base, Temporal 3 or Continuous tone.

**B200SRA:** Intelligent sounder base, Temporal 3 or Continuous tone, ULC-listed.

**B224RB:** Relay base Screw terminals: up to 14 AWG (2.0 mm<sup>2</sup>). Relay type: Form-C. Rating: 2.0 A @ 30 VDC resistive; 0.3 A @ 110 VDC inductive; 1.0 A @ 30 VDC inductive. Dimensions: 6.2" (15.748 cm) x 1.2" (3.048 cm)..

**B224RBA:** Relay base, ULC Listed.

**B224BI:** Isolator base. Dimensions: 6.2" (15.748 cm) x 1.2" (3.048 cm). Maximum: 25 devices between isolator bases.

**B224BIA:** Isolator base, ULC Listed.

## Listings and Approvals

- **UL Listed:** S911
- **ULC Listed:** S1115 (FSC-851A)
- **FM Approved**
- **CSFM:** 7272-0028:0255

## Specifications

### GENERAL SPECIFICATIONS

**Size:** Height: 2.4" (6.1 cm), Diameter: 4.0" (10.16 cm)

**Shipping Weight:** 4.6 ounces

**Color:** Ivory

**Operating Humidity Range:** 10 to 93% relative humidity (non-condensing)

**Application Temperature Range:** 32°F to 100°F (0°C to 38°C)

### ELECTRICAL SPECIFICATIONS

**Operating Voltage Range:** 15 to 32VDC

**Maximum Standby Current:** 200µA at 24VDC (no communications)

**Maximum Alarm Current (LED on):** 7mA at 24VDC

### SENSITIVITY SETTINGS & SUGGESTED APPLICATION

**Level 1:** 1% per foot (30.48 cm) of smoke. Very clean environments - Laboratories.

**Level 2:** 2% per foot (30.48 cm) of smoke. Clean environments - Offices.

**Level 3:** 3% per foot (30.48 cm) of smoke. Moderately clean environments - Hotel Room, Dorm Room.

**Level 4:** 3% per foot (30.48 cm) of smoke with different algorithm processing and weighting of sensor elements. Hotel rooms near a shower, Boiler Rooms.

**Level 5:** 4% per foot (30.48 cm) of smoke. Equipment rooms, Kitchens, Paint Shops.

**Level 6:** Thermal alarm at 135°F (57°C).

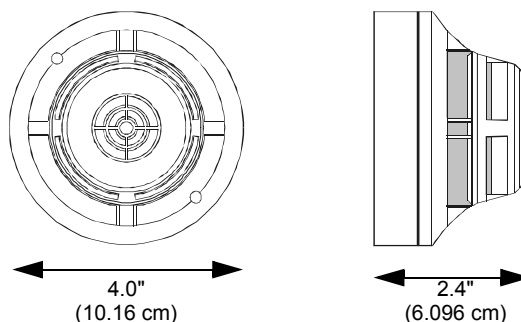
**NOTE:** Once the CO cell has reached the end of life, any device set to Level 3 or Level 4 will default to Level 5 and Level 5 will drop to 3%. The following sensitivities apply to devices with expired CO cells:

**Level 1:** 1% per foot (30.48 cm) of smoke. Very clean environments - Laboratories.

**Level 2:** 2% per foot (30.48 cm) of smoke. Clean environments - Offices.

**Level 5:** 3% per foot (30.48 cm) of smoke. Moderately clean environments - Hotel Room, Dorm Room.

**Level 6:** Thermal alarm at 135°F (57°C).



**FSC-851 IntelliQuad  
Advanced Multi-Criteria Detector**

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All specifications are subject to change without notice.

For more information, contact Notifier. Phone: (203) 484-7161, FAX: (203) 484-7118.  
[www.notifier.com](http://www.notifier.com)

# FST-851(A) Series

## Intelligent Thermal (Heat) Detectors with FlashScan®



Intelligent / Addressable Devices

### General

Notifier FST-851(A) Series intelligent plug-in thermal detectors with integral communication has features that surpass conventional detectors. Point ID capability allows each detector's address to be set with rotary, decimal address switches, providing exact detector locations. FST-851(A) Series thermal detectors use an innovative thermistor sensing circuit to produce 135°F/57°C fixed-temperature (FST-851/A) and rate-of-rise thermal detection (FST-851R/A) in a low-profile package. FST-851H(A) provides fixed high-temperature detection at 190°F/88°C. These thermal detectors provide effective, intelligent property protection in a variety of applications. FST-851(A) Series detectors are compatible with Notifier Onyx and CLIP series Fire Alarm Control Panels (FACPs).

FlashScan® (U.S. Patent 5,539,389) is a communication protocol developed by Notifier Engineering that greatly enhances the speed of communication between analog intelligent devices and certain NOTIFIER systems. Intelligent devices communicate in a grouped fashion. If one of the devices within the group has new information, the panel's CPU stops the group poll and concentrates on single points. The net effect is response speed greater than five times that of earlier designs.

### Features

- Sleek, low-profile, stylish design.
- State-of-the-art thermistor technology for fast response.
- Rate-of-rise model (FST-851R/A), 15°F (8.3°C) per minute.
- Factory preset fixed temperature at 135°F (57°C); high-temperature model fixed at 190°F (88°C).
- Addressable by device.
- Compatible with FlashScan® and CLIP protocol systems.
- Rotary, decimal addressing (1-99 on CLIP systems, 1-159 on FlashScan systems).
- Two-wire SLC connection.
- Visible LEDs "blink" every time the unit is addressed.
- 360°-field viewing angle of the visual alarm indicators (two bi-color LEDs). LEDs blink green in Normal condition and turn on steady red in Alarm.
- Integral communications and built-in device-type identification.
- Remote test feature from the panel.
- Built-in functional test switch activated by external magnet.
- Walk test with address display (an address of 121 will blink the detector LED 12-(pause)-1).
- Low standby current.
- Backward-compatible.
- Built-in tamper-resistant feature.
- Designed for direct-surface or electrical-box mounting.
- Sealed against back pressure.
- Plugs into separate base for ease of installation and maintenance. Separate base allows interchange of photoelectric, ionization and thermal sensors.
- SEMS screws for wiring of the separate base.
- Constructed of off-white fire-resistant plastic, designed to commercial standards, and offers an attractive appearance.



FST-851(A) in B210LP(A) Base

B210-2251.jpg

- 94-5V plastic flammability rating.
- Remote LED output connection to optional RA100Z(A) remote LED annunciator.
- Optional sounder, relay, and isolator bases.
- Optional flanged surface mounting kit.

### Specifications

**Size:** 2.1" (5.3 cm) high; base determines diameter.

- **B210LP(A):** 6.1" (15.5 cm) diameter.
- **B501(A):** 4.1" (10.4 cm) diameter.
- **B200S(A):** 6.875" (17.46 cm) diameter.
- **B200SR(A):** 6.875" (17.46 cm) diameter.
- **B224RB(A):** 6.2" (15.748 cm) diameter.
- **B224BI(A):** 6.2" (15.748 cm) diameter.

**Shipping weight:** 4.8 oz. (137 g).

**Operating temperature range:** FST-851(A) Series, FST-851R(A): -20°C to 38°C (-4°F to 100°F); FST-851H(A): -20°C to 66°C (-4°F to 150°F).

**Detector spacing:** UL approved for 50 ft. (15.24 m) center to center. FM approved for 25 x 25 ft. (7.62 x 7.62 m) spacing.

**Relative humidity:** 10% – 93% noncondensing.

**Thermal ratings:** fixed-temperature setpoint 135°F (57°C), rate-of-rise detection 15°F (8.3°C) per minute, high temperature heat 190°F (88°C).

### ELECTRICAL SPECIFICATIONS

**Voltage range:** 15 - 32 volts DC peak.

**Standby current (max. avg.):** 300 µA @ 24 VDC (one communication every 5 seconds with LED enabled).

**LED current (max.):** 6.5 mA @ 24 VDC ("ON").

### Applications

Use thermal detectors for protection of property. For further information, go to [systemsensor.com](http://systemsensor.com) for manual I56-407-00, Applications Manual for System Smoke Detectors, which provides detailed information on detector spacing, placement, zoning, wiring, and special applications.

## Installation

The FST Series plug-in intelligent thermal detectors use a separate base to simplify installation, service, and maintenance. Installation instructions are shipped with each detector. A special tool allows maintenance personnel to plug in and remove detectors without using a ladder.

Mount base (all base types) on an electrical backbox which is at least 1.5" (3.81 cm) deep. For a chart of compatible junction boxes, see *DN-60054*.

**NOTE: 1)** Because of the inherent supervision provided by the SLC loop, end-of-line resistors are not required. Wiring "T-taps" or branches are permitted for Style 4 (Class "B") wiring. **2)** When using relay or sounder bases, consult the ISO-X(A) installation sheet 156-1380 for device limitations between isolator modules and isolator bases.

## Agency Listings and Approvals

These listings and approvals apply to the modules specified in this document. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL Listed:** S747.
- **ULC Listed:** S6978.
- **MEA Listed:** 383-02-E.
- **FM Approved.**
- **CSFM:** 7270-0028:0196.
- **BSMI:** CI313066760025.
- **CCCF:** Certif. # 2004081801000018.
- **U.S. Coast Guard:** 161.002/42/1 (NFS-640); 161.002/50/0 (NFS2-640/NFS-320/NFS-320C, excluding B210LP(A)).
- **Lloyd's Register:** 11/600013 (NFS-640/NFS-320/NFS-320C, excluding B210LP(A)).

## Product Line Information

**NOTE:** "A" suffix indicates ULC Listed model.

**FST-851:** Intelligent thermal detector. Must be mounted to one of the bases listed below.

**FST-851A:** Same as FST-851 but with ULC Listing.

**FST-851R:** Intelligent thermal detector with rate-of-rise feature.

**FST-851RA:** Same as FST-851R but with ULC Listing.

**FST-851H:** Intelligent high-temperature thermal detector.

**FST-851HA:** Same as FST-851H but with ULC Listing.

## INTELLIGENT BASES

**NOTE:** "A" suffix indicates ULC Listed model.

**NOTE:** For details about intelligent bases and their mounting, see *DN-60054*.

**B210LP(A):** Standard U.S. flanged low-profile mounting base.

**B210LPBP:** Bulk pack of B210LP; package contains 10.

**B501(A):** Standard European flangeless mounting base.

**B501BP:** Bulk pack of B501; package contains 10.

**B200S(A):** Addressable Intelligent, programmable sounder base capable of producing sound output in high or low volume

with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone.

**B200SR(A):** Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone. Replaces B501BH series bases in retrofit applications.

**B224RB(A):** Intelligent relay base. Screw terminals: up to 14 AWG (2.0 mm<sup>2</sup>). Relay type: Form-C. Rating: 2.0 A @ 30 VDC resistive; 0.3 A @ 110 VDC inductive; 1.0 A @ 30 VDC inductive.

**B224BI(A):** Intelligent isolator base. Isolates SLC from loop shorts. Maximum: 25 devices between isolator bases; see Note 2 under Installation.

## ACCESSORIES

**F110:** Retrofit flange to convert B210LP(A) to match the B710LP(A) profile, or to convert older high-profile bases to low-profile.

**F110BP:** Bulk pack of F110; package contains 15.

**F210:** Replacement flange for B210LP(A) base.

**RA100Z(A):** Remote LED annunciator. 3 – 32 VDC. Fits U.S. single-gang electrical box. Supported by B210LP(A) and B501(A) bases only.

**SMB600:** Surface mounting kit, flanged.

**M02-04-00:** Test magnet.

**M02-09-00:** Test magnet with telescoping handle.

**XR2B:** Detector removal tool. Allows installation and/or removal of FlashScan® Series detector heads from base in high ceiling installations. Includes T55-127-010.

**T55-127-010:** Detector removal tool without pole.

**XP-4:** Extension pole for XR2B. Comes in three 5-foot (1.524 m) sections.

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This document is not intended to be used for installation purposes.  
We try to keep our product information up-to-date and accurate.  
We cannot cover all specific applications or anticipate all requirements.  
All specifications are subject to change without notice.



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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7270-0028:0196

Page 1 of 1

**CATEGORY:** 7270 -- HEAT DETECTOR

**LISTEE:** NotifierOne Fire-Lite Place, Northford, CT 06472-1653  
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309  
Email: vladimir.kireyev@honeywell.com

**DESIGN:** Models FST-751, -851, -851R, -851H (fixed temperature) and FST-751R (fixed temperature with Rate-of-Rise) electronic heat detectors. Refer to listee's data sheet for additional detailed product description and operational considerations.

**RATING:** Models FST-751, -751R, -851, and -851R = 135°F fixed temperature  
Model FST-851H = 190°F fixed temperature

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, model number, electrical ratings, and UL label.

**APPROVAL:** Listed as heat detectors for use with Models B501, \*B210LP (CSFM Listing No. 7300-1653:0109), or B710LP base (CSFM Listing No. 7300-0028:173) and separately listed compatible fire alarm control units. Refer to listee's Installation Instructions Manual for details.

\*11-22-2016 dc



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2018**

Listing Expires **June 30, 2019**

Authorized By: **DAVID CASTILLO**, Program Coordinator  
Fire Engineering Division

# Intelligent Bases

**B501(A), B200S(A), B200SR(A),  
B210LP(A), B2241BI(A), B224RB(A),  
Mounting Kits, and Accessories**



**Addressable Devices**

## General

Intelligent FlashScan® and CLIP mounting bases and kits provide a variety of ways to install NOTIFIER detectors in any application. Intelligent detectors can be mounted in either flanged or flangeless bases depending on junction box selection (see *Junction Box Selection Guide*). Across this product line, detectors plug in easily to the base with SEMS screws; and models employ various 12 to 24 AWG wire ranges.

**Relay, isolator, and sounder bases** can be used to meet local code requirements. Relay bases provide one Form-C contact relay for control of auxiliary functions such as door closure and elevator recall. Isolator bases allow loops to continue to operate under fault conditions and automatically restore when the fault is removed. Sounder bases are available in temporal and non-temporal pattern versions depending on whether the signal is to be used for evacuation purposes.

## Specifications

### Diameter:

- B501: 4.1" (104 mm).
- B224BI, B224RB, B210LP: 6.1" (155 mm).
- B200S/SR: 6.875" (17.46 cm).

### Wire gauge:

- B224BI, B224RB: 14 to 24 AWG.
- B210LP, B501, B200S/SR: 12 to 24 AWG.

### Temperature range:

- B224BI, B224RB, B200S/SR: 32°F to 120°F (0°C to 49°C).
- B210LP, B501: -4°F to 150°F (-20°C to 66°C).

**Humidity range:** 10% to 93% RH, non-condensing.

**System temperature and humidity ranges:** This system meets NFPA requirements for operation at 0°C to 49°C (32°F to 120°F); and at a relative humidity (noncondensing) of 85% at 30°C (86°F) per NFPA, and 93% ± 2% at 32°C ± 2°C (89.6°F ± 1.1°F) per ULC. However, the useful life of the system's standby batteries and the electronic components may be adversely affected by extreme temperature ranges and humidity. Therefore, it is recommended that this system and all peripherals be installed in an environment with a nominal room temperature of 15°C to 27°C (60°F to 80°F).

## Electrical Ratings

### FOR B200S/SR:

**External supply voltage:** 16 to 33 VDC (VFWR)

**Standby current:** 500 µA maximum.

### Alarm current:

- B200S: 25 mA maximum at high-volume setting; 15 mA maximum at low-volume setting.
- B200SR: 35 mA maximum.

**SLC operating voltage:** 15 to 32 VDC.

**SLC standby current:** 300 µA.



Flangeless Mounting Base  
B501(A)



Flanged Mounting Base  
B210LP(A)



Sounder Base  
B200S(A), B200SR(A)



Relay Base  
B224RB(A)

**Sound output:** measured in a UL reverberant room at 10 feet, 24 Volts (continuous tone).

- B200S, high-volume: Greater than 85 dBA minimum.
- B200S, low-volume: Greater than 75 dBA minimum.
- B200SR: Greater than 85 dBA minimum.

### FOR B224RB, B224BI:

**Operating voltage:** 15 to 32 VDC (powered by SLC).

**Standby ratings:** <500 µA maximum @ 24 VDC.

**Set time (B224RB only):** short delay 55 to 90 msec; long delay 6 to 9 seconds.

**Reset time (B224RB only):** 20 msec maximum.

**Relay characteristics (B224RB only):** two-coil latching relay; one Form-C contact; ratings (UL/CSA): 0.9 A @ 125 VAC, 0.9 A @ 110 VDC, and 3.0 A @ 30 VDC.

## Product Line Information

### INTELLIGENT BASES

**B501:** Flangeless mounting base.

**B501A:** Flangeless mounting base, ULC Listed.

**B501BP:** Bulk pack of B501 (10).

**B210LP:** Flanged mounting base.

**B210LPA:** Flanged mounting base, ULC listed

**B210LPBP:** Bulk pack of B210LP (10).

**B200S:** Intelligent addressable sounder base capable of producing sound output in high or low volume with ANSI Temporal 3, ANSI Temporal 4, continuous tone, marching tone, and custom tone.

**B200SA:** Same as B200S with ULC-listing.

**B200SR:** Intelligent sounder base capable of producing sound output with ANSI Temporal 3 or continuous tone.

**B200SRA:** Same as B200SR with ULC-listing.

**B224RB:** Relay base.

**B224RBA:** Relay base, ULC Listed.

**B224BI:** Isolator base.

**B224BIA:** Isolator base, ULC Listed.

**MOUNTING KITS AND ACCESSORIES**

**SMB600:** Surface mounting kit, flanged.

**F110:** Retrofit flange for converting high-profile bases to low-profile.

**F110BP:** Bulk pack of F110 (10).

**F210:** Accessory flange ring for B210LP(A) base (new design). 6-inch diameter.

**F210BP:** Bulk pack of F210 (10).

**RA100Z:** Remote LED annunciator.

**RA100ZA:** Remote LED annunciator, ULC Listed.

**M02-04-00:** Detector test magnet.

**M02-09-00:** Test magnet with telescoping handle.

**XR2B:** Detector removal tool for current heads (*T55-127-010 included*).

**XR2:** Detector Remove Tool for use with low profile detector heads, and FSL-751.

**XP-4:** Extension pole for XR2/B (*5 to 15 ft/1.524 to 4.572 m*).

**T55-127-010:** Detector removal head.

**BCK-200B:** Black detector kit, package of 10 (for use with photo and ion detectors).

**WCK-200B:** White detector kit, package of 10 (for use with photo and ion detectors).

**Agency Listings and Approvals**

The listings and approvals below apply to intelligent bases as noted. In some cases, certain modules or applications may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL Listed:** S911
- **ULC Listed:** S911
- **FM Approved**
- **MEA:** 22-95-E, 205-94-E Vol. 2; 257-06-E
- **CSFM:** 7300-1653:0126, 7135-1653:0213, 7300-0028:0173, 7300-1653:0109

**Junction Box Selection Guide**

Base Models	Single Gang	3.5" Oct.	4.0" Oct.	4.0" Sq.	4.0" Sq. with 3.0" mud ring	50 mm	60 mm	70 mm	75 mm
B200S, B200SR	Yes	Yes	Yes	Yes	Yes	No	No	No	No
B501	No	Yes	No	No	Yes	Yes	Yes	Yes	No
B210LP	Yes	Yes	Yes	Yes	Yes	No	No	No	No
B224RB	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
B224BI	No	Yes	Yes	Yes	No	No	No	Yes	Yes

**NOTE:** Box depth contingent on base and wire size. Refer to National Electric Code or applicable local codes for appropriate recommendations.

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FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7300-1653:0109 Page 1 of 1

**CATEGORY:** 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

**LISTEE:** System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174  
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309  
Email: Vladimir.Kireyev@honeywell.com

**DESIGN:** Models B401, B401B, B401R, B401BR, B401BR-750, B401R-750, B402B, B404B, B404BT, B406B, B501, B501B, 14506587-002, B501BH, B501BHT, B401BH, B110LP, B110RLP, B110RLP750, B112LP, B114LP, B114LPBT, B116LP, B210LP, B501-BL, B501-IV, \*B501-WHITE, B300-6, B300-6-IV, B300-6-IS detector bases. Refer to listee's data sheet for detailed product description and operational considerations.

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes and ordinances and in a manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, \*model number, \*electrical rating and UL label.

**APPROVAL:** Listed as detector bases for use with separately listed compatible detectors. \*Refer to Manufacturers Installation Instruction Manual for details.

**NOTE:** Formerly 7300-1209:128

\*Rev 04-03-18 gt



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Date Issued: **July 01, 2018**

Listing Expires **June 30, 2019**

Authorized By: **DAVID CASTILLO, Program Coordinator**  
*Fire Engineering Division*

# FMM-1(A), FMM-101(A), FZM-1(A) & FDM-1(A)

## Monitor Modules with FlashScan®



Intelligent/Addressable Devices

### General

Four different monitor modules are available for Notifier's intelligent control panels for a variety of applications. Monitor modules supervise a circuit of dry-contact input devices, such as conventional heat detectors and pull stations, or monitor and power a circuit of two-wire smoke detectors (FZM-1(A)).

**FMM-1(A)** is a standard-sized module (typically mounts to a 4" [10.16 cm] square box) that supervises either a Style D (Class A) or Style B (Class B) circuit of dry-contact input devices.

**FMM-101(A)** is a miniature monitor module a mere 1.3" (3.302 cm) H x 2.75" (6.985 cm) W x 0.5" (1.270 cm) D that supervises a Style B (Class B) circuit of dry-contact input devices. Its compact design allows the FMM-101(A) to be mounted in a single-gang box behind the device it monitors.

**FZM-1(A)** is a standard-sized module that monitors and supervises compatible two-wire, 24 volt, smoke detectors on a Style D (Class A) or Style B (Class B) circuit.

**FDM-1(A)** is a standard-sized dual monitor module that monitors and supervises two independent two-wire Style B (Class B) dry-contact initiating device circuits (IDCs) at two separate, consecutive addresses in intelligent, two-wire systems.

FlashScan® (U.S. Patent 5,539,389) is a communication protocol developed by NOTIFIER that greatly increases the speed of communication between analog intelligent devices. Intelligent devices communicate in a grouped fashion. If one of the devices within the group has new information, the panel CPU stops the group poll and concentrates on single points. The net effect is response speed greater than five times that of other designs.

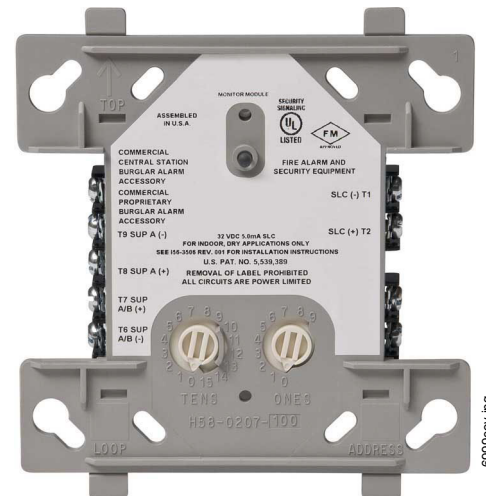
### FMM-1(A) Monitor Module

- Built-in type identification automatically identifies this device as a monitor module to the control panel.
- Powered directly by two-wire SLC loop. No additional power required.
- High noise (EMF/RFI) immunity.
- SEMS screws with clamping plates for ease of wiring.
- Direct-dial entry of address: 01 – 159 on FlashScan loops; 01 – 99 on CLIP loops.
- LED flashes green during normal operation (this is a programmable option) and latches on steady red to indicate alarm.

The FMM-1(A) Monitor Module is intended for use in intelligent, two-wire systems, where the individual address of each module is selected using the built-in rotary switches. It provides either a two-wire or four-wire fault-tolerant Initiating Device Circuit (IDC) for normally-open-contact fire alarm and supervisory devices. The module has a panel-controlled LED indicator. The FMM-1(A) can be used to replace MMX-1(A) modules in existing systems.

### FMM-1(A) APPLICATIONS

Use to monitor a zone of four-wire smoke detectors, manual fire alarm pull stations, waterflow devices, or other normally-open dry-contact alarm activation devices. May also be used to monitor normally-open supervisory devices with special supervisory indication at the control panel. Monitored circuit may be wired as an NFPA Style B (Class B) or Style D (Class



FMM-1(A) (Type H)

A) Initiating Device Circuit. A 47K ohm End-of-Line Resistor (provided) terminates the Style B circuit. No resistor is required for supervision of the Style D circuit.

### FMM-1(A) OPERATION

Each FMM-1(A) uses one of the available module addresses on an SLC loop. It responds to regular polls from the control panel and reports its type and the status (open/normal/short) of its Initiating Device Circuit (IDC). A flashing LED indicates that the module is in communication with the control panel. The LED latches steady on alarm (subject to current limitations on the loop).

### FMM-1(A) SPECIFICATIONS

**Nominal operating voltage:** 15 to 32 VDC.

**Maximum current draw:** 5.0 mA (LED on).

**Average operating current:** 350  $\mu$ A (LED flashing), 1 communication every 5 seconds, 47k EOL.

**Maximum IDC wiring resistance:** 40 ohms.

**EOL resistance:** 47K ohms.

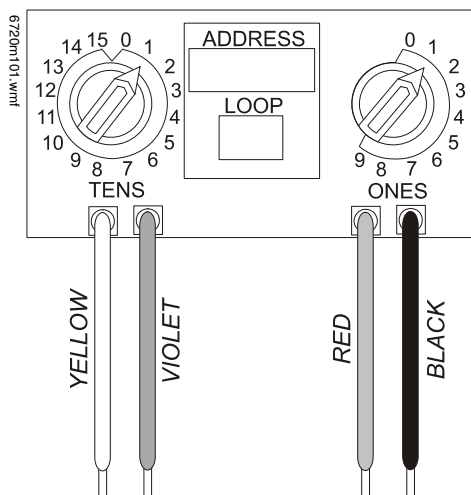
**Temperature range:** 32°F to 120°F (0°C to 49°C).

**Humidity range:** 10% to 93% noncondensing.

**Dimensions:** 4.5" (11.43 cm) high x 4" (10.16 cm) wide x 1.25" (3.175 cm) deep. Mounts to a 4" (10.16 cm) square x 2.125" (5.398 cm) deep box.

## FMM-101(A) Mini Monitor Module

- Built-in type identification automatically identifies this device as a monitor module to the panel.
- Powered directly by two-wire SLC loop. No additional power required.
- High noise (EMF/RFI) immunity.
- Tinned, stripped leads for ease of wiring.
- Direct-dial entry of address: 01 – 159 on FlashScan loops; 01 – 99 on CLIP loops.



The FMM-101(A) Mini Monitor Module can be installed in a single-gang junction directly behind the monitored unit. Its small size and light weight allow it to be installed without rigid mounting. The FMM-101(A) is intended for use in intelligent, two-wire systems where the individual address of each module is selected using rotary switches. It provides a two-wire initiating device circuit for normally-open-contact fire alarm and security devices. The FMM-101(A) can be used to replace MMX-101(A) modules in existing systems.

### FMM-101(A) APPLICATIONS

Use to monitor a single device or a zone of four-wire smoke detectors, manual fire alarm pull stations, waterflow devices, or other normally-open dry-contact devices. May also be used to monitor normally-open supervisory devices with special supervisory indication at the control panel. Monitored circuit/device is wired as an NFPA Style B (Class B) Initiating Device Circuit. A 47K ohm End-of-Line Resistor (provided) terminates the circuit.

### FMM-101(A) OPERATION

Each FMM-101(A) uses one of the available module addresses on an SLC loop. It responds to regular polls from the control panel and reports its type and the status (open/normal/short) of its Initiating Device Circuit (IDC).

### FMM-101(A) SPECIFICATIONS

Nominal operating voltage: 15 to 32 VDC.

**Average operating current:** 350  $\mu$ A, 1 communication every 5 seconds, 47k EOL; 600  $\mu$ A Max. (Communicating, IDC Shorted).

**Maximum IDC wiring resistance:** 40 ohms.

**Maximum IDC Voltage:** 11 Volts.

**Maximum IDC Current:** 400  $\mu$ A.

**EOL resistance:** 47K ohms.

**Temperature range:** 32°F to 120°F (0°C to 49°C).

**Humidity range:** 10% to 93% noncondensing.

**Dimensions:** 1.3" (3.302 cm) high x 2.75" (6.985 cm) wide x 0.65" (1.651 cm) deep.

**Wire length:** 6" (15.24 cm) minimum.

## FZM-1(A) Interface Module

- Supports compatible two-wire smoke detectors.
- Supervises IDC wiring and connection of external power source.
- High noise (EMF/RFI) immunity.
- SEMS screws with clamping plates for ease of wiring.
- Direct-dial entry of address: 01 – 159 on FlashScan loops, 01 – 99 on CLIP loops.
- LED flashes during normal operation; this is a programmable option.
- LED latches steady to indicate alarm on command from control panel.

The FZM-1(A) Interface Module is intended for use in intelligent, addressable systems, where the individual address of each module is selected using built-in rotary switches. This module allows intelligent panels to interface and monitor two-wire conventional smoke detectors. It transmits the status (normal, open, or alarm) of one full zone of conventional detectors back to the control panel. All two-wire detectors being monitored must be UL compatible with the module. The FZM-1(A) can be used to replace MMX-2(A) modules in existing systems.

### FZM-1(A) APPLICATIONS

Use the FZM-1(A) to monitor a zone of two-wire smoke detectors. The monitored circuit may be wired as an NFPA Style B (Class B) or Style D (Class A) Initiating Device Circuit. A 3.9 K ohm End-of-Line Resistor (provided) terminates the end of the Style B or D (class B or A) circuit (maximum IDC loop resistance is 25 ohms). Install ELR across terminals 8 and 9 for Style D application.

### FZM-1(A) OPERATION

Each FZM-1(A) uses one of the available module addresses on an SLC loop. It responds to regular polls from the control panel and reports its type and the status (open/normal/short) of its Initiating Device Circuit (IDC). A flashing LED indicates that the module is in communication with the control panel. The LED latches steady on alarm (subject to current limitations on the loop).

### FZM-1(A) SPECIFICATIONS

**Nominal operating voltage:** 15 to 32 VDC.

**Maximum current draw:** 5.1 mA (LED on).

**Maximum IDC wiring resistance:** 25 ohms.

**Average operating current:** 300  $\mu$ A, 1 communication and 1 LED flash every 5 seconds, 3.9k eol.

**EOL resistance:** 3.9K ohms.

**External supply voltage (between Terminals T3 and T4):** DC voltage: 24 volts power limited. Ripple voltage: 0.1 Vrms maximum. Current: 90 mA per module maximum.

**Temperature range:** 32°F to 120°F (0°C to 49°C).

**Humidity range:** 10% to 93% noncondensing.

**Dimensions:** 4.5" (11.43 cm) high x 4" (10.16 cm) wide x 1.25" (3.175 cm) deep. Mounts to a 4" (10.16 cm) square x 2.125" (5.398 cm) deep box.

## FDM1(A) Dual Monitor Module

The FDM-1(A) Dual Monitor Module is intended for use in intelligent, two-wire systems. It provides two independent two-wire initiating device circuits (IDCs) at two separate, consecutive addresses. It is capable of monitoring normally open contact fire alarm and supervisory devices; or either normally open or normally closed security devices. The module has a single panel-controlled LED.

**NOTE:** The FDM-1(A) provides two Style B (Class B) IDC circuits ONLY. Style D (Class A) IDC circuits are NOT supported in any application.

### FDM-1(A) SPECIFICATIONS

**Normal operating voltage range:** 15 to 32 VDC.

**Maximum current draw:** 6.4 mA (LED on).

**Average operating current:** 750  $\mu$ A (LED flashing).

**Maximum IDC wiring resistance:** 1,500 ohms.

**Maximum IDC Voltage:** 11 Volts.

**Maximum IDC Current:** 240  $\mu$ A

**EOL resistance:** 47K ohms.

**Maximum SLC Wiring resistance:** 40 Ohms.

**Temperature range:** 32° to 120°F (0° to 49°C).

**Humidity range:** 10% to 93% (non-condensing).

**Dimensions:** 4.5" (11.43 cm) high x 4" (10.16 cm) wide x 2.125" (5.398 cm) deep.

### FDM-1(A) AUTOMATIC ADDRESSING

The FDM-1(A) automatically assigns itself to two addressable points, starting with the original address. For example, if the FDM-1(A) is set to address "26", then it will automatically assign itself to addresses "26" and "27".

**NOTE:** "Ones" addresses on the FDM-1(A) are 0, 2, 4, 6, or 8 only. Terminals 6 and 7 use the first address, and terminals 8 and 9 use the second address.



#### CAUTION:

Avoid duplicating addresses on the system.

## Installation

FMM-1(A), FZM-1(A), and FDM-1(A) modules mount directly to a standard 4" (10.16 cm) square, 2.125" (5.398 cm) deep, electrical box. They may also be mounted to the SMB500 surface-mount box. Mounting hardware and installation instructions are provided with each module. All wiring must conform to applicable local codes, ordinances, and regulations. These modules are intended for power-limited wiring only.

The FMM-101(A) module is intended to be wired and mounted without rigid connections inside a standard electrical box. All wiring must conform to applicable local codes, ordinances, and regulations.

## Agency Listings and Approvals

In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL:** S635
- **ULC:** S635
- **FM Approved**
- **CSFM:** 7300-0028:0219
- **MEA:** 457-99-E
- **U.S. Coast Guard:**

– 161.002/23/3 (AFP-200: FMM-1/-101, FZM-1)

– 161.002/42/1 (NFS-640: FMM-1/-101)

- **Lloyd's Register:**

– 03/60011/E1 (FMM-1/-101, FZM-1)

– 94/60004/E2 (AFP-200: except FDM-1)

– 02/60007 (NFS-640: FDM-1)

- **FDNY:** COA #6038 (NFS2-640, NFS-320), COA# 6058 (NFS2-3030)

## Product Line Information

**NOTE:** "A" suffix indicates ULC-listed model.

**FMM-1(A):** Monitor module.

**FMM-101(A):** Monitor module, miniature.

**FZM-1(A):** Monitor module, two-wire detectors.

**FDM-1(A):** Monitor module, dual, two independent Class B circuits.

**SMB500:** Optional surface-mount backbox.

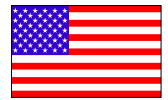
**NOTE:** See installation instructions and refer to the SLC Wiring Manual, PN 51253.

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This document is not intended to be used for installation purposes.  
We try to keep our product information up-to-date and accurate.  
We cannot cover all specific applications or anticipate all requirements.  
All specifications are subject to change without notice.



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[www.notifier.com](http://www.notifier.com)

# FCM-1(A) & FRM-1(A) Series

## Control and Relay Modules



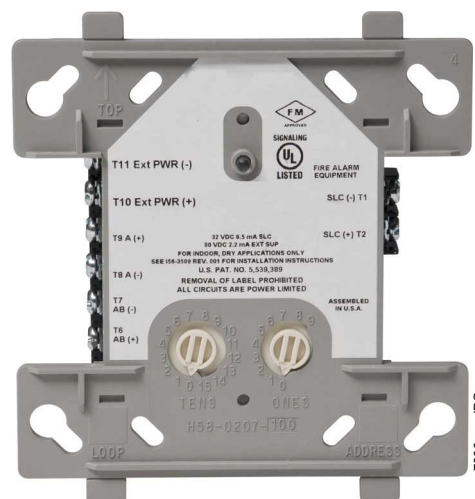
Intelligent / Addressable Devices

### General

**FCM-1(A) Control Module:** The FCM-1(A) Addressable Control Module provides Notifier intelligent fire alarm control panels a circuit for Notification Appliances (horns, strobes, speakers, etc.). Addressability allows the FCM-1(A) to be activated, either manually or through panel programming, on a select (zone or area of coverage) basis.

**FRM-1(A) Relay Module:** The FRM-1(A) Addressable Relay Module provides the system with a dry-contact output for activating a variety of auxiliary devices, such as fans, dampers, control equipment, etc. Addressability allows the dry contact to be activated, either manually or through panel programming, on a select basis.

FlashScan® (U.S. Patent 5,539,389) is a communication protocol developed by NOTIFIER Engineering that greatly enhances the speed of communication between analog intelligent devices. Intelligent devices communicate in a grouped fashion. If one of the devices within the group has new information, the panel CPU stops the group poll and concentrates on single points. The net effect is response speed greater than five times that of other designs.



FCM-1(A)

### Features

- Built-in type identification automatically identifies these devices to the control panel.
- Internal circuitry and relay powered directly by two-wire SLC loop. The FCM-1(A) module requires power (for horns, strobes, etc.), or audio (for speakers).
- Integral LED “blinks” green each time a communication is received from the control panel and turns on in steady red when activated.
- LED blink may be deselected globally (affects all devices).
- High noise immunity (EMF/RFI).
- The FCM-1(A) may be used to switch 24-volt NAC power, audio (up to 70.7 Vrms).
- Wide viewing angle of LED.
- SEMS screws with clamping plates for wiring ease.
- Direct-dial entry of address 01– 159 for FlashScan loops, 01 – 99 for CLIP mode loops.
- Speaker, and audible/visual applications may be wired for Class B or A (Style Y or Z).

### Applications

The FCM-1(A) is used to switch 24 VDC audible/visual power, high-level audio (speakers). The FRM-1(A) may be programmed to operate dry contacts for applications such as door holders or Air Handling Unit shutdown, and to reset four-wire smoke detector power.

**NOTE:** Refer to the SLC Manual (PN 51253) for details regarding releasing applications with the FCM-1(A). Refer to the FCM-1-REL datasheet (DN-60390) for new FlashScan® releasing applications.

### Construction

- The face plate is made of off-white heat-resistant plastic.
- Controls include two rotary switches for direct-dial entry of address (01-159).

- The FCM-1(A) is configured for a single Class B (Style Y) or Class A (Style Z) Notification Appliance Circuit.
- The FRM-1(A) provides two Form-C dry contacts that switch together.

### Operation

Each FCM-1(A) or FRM-1(A) uses one of 159 possible module addresses on a SLC loop (99 on CLIP loops). It responds to regular polls from the control panel and reports its type and status, including the open/normal/short status of its Notification Appliance Circuit (NAC). The LED blinks with each poll received. On command, it activates its internal relay. The FCM-1(A) supervises Class B (Style Y) or Class A (Style Z) notification or control circuits.

Upon code command from the panel, the FCM-1(A) will disconnect the supervision and connect the external power supply in the proper polarity across the load device. The disconnection of the supervision provides a positive indication to the panel that the control relay actually turned ON. The external power supply is always relay isolated from the communication loop so that a trouble condition on the external power supply will never interfere with the rest of the system.

Rotary switches set a unique address for each module. The address may be set before or after mounting. The built-in TYPE CODE (not settable) will identify the module to the control panel, so as to differentiate between a module and a sensor address.

### Specifications for FCM-1(A)

**Normal operating voltage:** 15 to 32 VDC.

**Maximum current draw:** 6.5 mA (LED on).

**Average operating current:** 350  $\mu$ A direct poll, 375  $\mu$ A group poll with LED flashing, 485  $\mu$ A Max. (LED flashing, NAC shorted.)

Maximum NAC Line Loss: 4 VDC.

**External supply voltage (between Terminals T10 and T11):** Maximum (NAC): Regulated 24 VDC; Maximum (Speakers): 70.7 V RMS, 50W.

**Drain on external supply:** 1.7 mA maximum using 24 VDC supply; 2.2 mA Maximum using 80 VRMS supply.

**Max NAC Current Ratings:** For class B wiring system, the current rating is 3A; For class A wiring system, the current rating is 2A.

**Temperature range:** 32°F to 120°F (0°C to 49°C).

**Humidity range:** 10% to 93% non-condensing.

**Dimensions:** 4.5" (114.3 mm) high x 4" (101.6 mm) wide x 1.25" (31.75 mm) deep. Mounts to a 4" (101.6 mm) square x 2.125" (53.975 mm) deep box.

**Accessories:** SMB500 Electrical Box; CB500 Barrier

## Specifications for FRM-1(A)

**Normal operating voltage:** 15 to 32 VDC.

**Maximum current draw:** 6.5 mA (LED on).

**Average operating current:** 230 µA direct poll; 255 µA group poll.

**EOL resistance:** not used.

**Temperature range:** 32°F to 120°F (0°C to 49°C).

**Humidity range:** 10% to 93% non-condensing.

**Dimensions:** 4.5" (114.3 mm) high x 4" (101.6 mm) wide x 1.25" (31.75 mm) deep. Mounts to a 4" (101.6 mm) square x 2.125" (53.975 mm) deep box.

**Accessories:** SMB500 Electrical Box; CB500 Barrier

## Agency Listings and Approvals

In some cases, certain modules may not be listed by certain approval agencies, or listing may be in process. Consult factory for latest listing status.

- **UL:** S635
- **ULC:** S3705 (A version only)
- **FM Approved**
- **CSFM:** 7300-0028:0219
- **MEA:** 14-00-E
- **FDNY:** COA #6067, #6065

## Contact Ratings for FRM-1(A)

Current Rating	Maximum Voltage	Load Description	Application
3 A	30 VDC	Resistive	Non-Coded
2 A	30 VDC	Resistive	Coded
.9 A	110 VDC	Resistive	Non-Coded
.9 A	125 VDC	Resistive	Non-Coded
.5 A	30 VDC	Inductive (L/R=5ms)	Coded
1 A	30 VDC	Inductive (L/R=2ms)	Coded
.3 A	125 VAC	Inductive (PF=0.35)	Non-Coded
1.5 A	25 VAC	Inductive (PF=0.35)	Non-Coded
.7 A	70.7 VAC	Inductive (PF=0.35)	Non-Coded
2 A	25 VAC	Inductive (PF=0.35)	Non-Coded

**NOTE:** Maximum (Speakers): 70.7 V RMS, 50 W

## Product Line Information

**NOTE:** "A" suffix indicates ULC Listed model.

**FCM-1(A):** Intelligent Addressable Control Module.

**FRM-1(A):** Intelligent Addressable Relay Module.

**A2143-20:** Capacitor, required for Class A (Style Z) operation of speakers.

**SMB500:** Optional Surface-Mount Backbox.

**CB500:** Control Module Barrier — required by UL for separating power-limited and non-power limited wiring in the same junction box as FCM-1(A).

**NOTE:** For installation instructions, see the following documents:

- *FCM-1(A) Installation document I56-1169.*
- *FRM-1(A) Installation document I56-3502.*
- *Notifier SLC Wiring Manual, document 51253.*

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This document is not intended to be used for installation purposes.  
We try to keep our product information up-to-date and accurate.  
We cannot cover all specific applications or anticipate all requirements.  
All specifications are subject to change without notice.



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www.notifier.com

CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7300-0028:0219

Page 1 of 1

**CATEGORY:** 7300 -- FIRE ALARM CONTROL UNIT ACCESSORIES/MISC. DEVICES

**LISTEE:** NotifierOne Fire-Lite Place, Northford, CT 06472-1653  
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309  
Email: vladimir.kireyev@honeywell.com

**DESIGN:** Models XP6-R relay module, XP6-C, supervising control module, XP10-M input monitor module, XP6-MA six zone interface module, FMM-1, FMM-101, FZM-1, FSM-101, FDM-1, FTM-1 monitor modules, FCM-1, FRM-1 control modules, and \*FDRM-1 with 2 input/2 output relay module. All devices are intended to be connected between the signaling line circuit of a compatible fire alarm control panel. Refer to listee's data sheet for additional detailed product description and operational considerations.

**RATING:** 16-33 VDC Primary

**INSTALLATION:** In accordance with listee's printed installation instructions, applicable codes & ordinances and in manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, product number and UL label.

**APPROVAL:** Listed as control unit accessories for use with listee's separately listed compatible fire alarm control units. Model FTM-1 is intended to be used with Notifier Models NFS-640, NFS2-640 (CSFM Listing No. 7165-0028:214), NFS-3030, NFS2-3030 (CSFM Listing No. 7165-0028:224) Fire Alarm Control Units.

**NOTE:** If an external power supply is used for Model XP6-MA, the negative of the external power supply is referenced to the negative of the auxiliary supply of the compatible control panel. This is done in order to detect ground faults on the initiating circuit.

\*Rev. 10-24-11 mt



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2018**

Listing Expires **June 30, 2019**

Authorized By: **DAVID CASTILLO, Program Coordinator**  
*Fire Engineering Division*





## Indoor Selectable-Output Speaker Strobes and Dual Voltage Evacuation Speakers for Ceiling Applications

*SpectrAlert® Advance selectable-output speaker strobes and dual-voltage evacuation speakers can reduce ground faults and enable faster installation.*



### Features

- Plug-in design and protective cover reduce ground faults
- Universal mounting plate with an onboard shorting spring tests wiring continuity before installation
- No extension ring required
- Field selectable candela settings:  
Standard: 15, 15/75, 30, 75, 95, 110, 115  
High: 135, 150, 177, 185
- Automatic selection of 12- or 24-volt operation at 15 and 15/75 candela
- Rotary switch simplifies field selection of speaker voltage (25 and 70.7 Vrms) and power settings (¼, ½, 1 and 2 watts)
- SP speakers offer high fidelity sound output
- SPV speakers offer high volume sound output
- Compatible with System Sensor synchronization protocol
- Electrical compatibility with existing SpectrAlert products
- Optional tamper resistant Torx head screw included

**The SpectrAlert Advance Series** of speakers and speaker strobes reduce costly ground faults using a plug-in design and universal mounting plate that allow the installer to pre-wire mounting plates, dress the wires, and confirm wiring continuity before plugging in the speakers. In addition, a protective plastic cover prevents nicked wires by covering exposed speaker components.

These devices also enable faster installations by providing instant feedback to ensure that wiring is properly connected, rotary switches to select voltage and power settings, and 11 field-selectable candela settings for both wall and ceiling speaker strobes.

The low total harmonic distortion of the SP speaker offers high fidelity sound output while the SPV speaker offers high volume sound output for use in high ambient noise applications.

### SpectrAlert Advance makes installation easy

- Attach a universal mounting plate to a 4 × 4 × 2⅞ inch back box. Flush-mount applications do not require an extension ring.
- Connect the notification appliance circuit or speaker wiring to the terminals on the mounting plate.
- Attach the speaker or speaker strobe to the mounting plate by inserting the product tabs into the mounting plate grooves. Rotate the device into position to lock the product pins into the mounting plate terminals. The device will temporarily hold in place with a catch until it is secured with a captured mounting screw.

### Agency Listings



S4048



7320-1653:201



10-08-E

# SpectrAlert Advance Speaker and Speaker Strobe Specifications

## Architectural/Engineering Specifications

### General

SpectrAlert Advance speaker and speaker strobes shall mount to a 4 × 4 × 2<sup>1</sup>/<sub>8</sub>-inch back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance speaker strobes, when used with the Sync-Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync-Circuit Module, 12-volt rated notification appliance circuit outputs shall operate between nine and 17.5 volts; 24-volt rated notification appliance circuit outputs shall operate between 17 and 33 volts. Indoor SpectrAlert Advance products shall operate between 32°F and 120°F from a regulated DC, or full-wave rectified, unfiltered power supply. Speaker strobes shall have field-selectable candela settings including 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, 185.

### Speaker

The speaker shall be a System Sensor SpectrAlert Advance model \_\_\_\_\_ dual-voltage transformer speaker capable of operating at 25.0 or 70.7 nominal Vrms. It should be listed to UL 1480 and shall be approved for fire protective service. The speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature between 32°F and 120°F. The speaker shall have power taps and voltage that are selected by rotary switches.

### Speaker Strobe combination

The speaker strobe shall be a System Sensor SpectrAlert Advance model \_\_\_\_\_ listed to UL1480 and UL 1971 and be approved for fire protective signaling systems. The speaker shall be capable of operating at 25.0 or 70.7 nominal Vrms selected via rotary switch, and shall have a frequency range of 400 to 4,000 Hz. The speaker shall have power taps that are selected by rotary switch. The strobe shall comply with the NFPA 72 requirements for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The strobe light shall consist of a xenon flash tube and associated lens/reflector system.

### Synchronization Module

The module shall be a System Sensor Sync-Circuit model MDL listed to UL 464 and shall be approved for fire protective service. The module shall synchronize SpectrAlert strobes at 1 Hz. The module shall mount to a 4<sup>11</sup>/<sub>16</sub> × 4<sup>11</sup>/<sub>16</sub> × 2<sup>1</sup>/<sub>8</sub>-inch back box. The module shall also control two Style Y (class B) circuits or one Style Z (class A) circuit. The module shall synchronize multiple zones. Daisy chaining two or more synchronization modules together will synchronize all the zones they control. The module shall not operate on a coded power supply.

## Physical Specifications

**Operating Temperature** 32°F to 120°F (0°C to 49°C)

**Humidity Range** 10 to 93% non-condensing

### Dimensions, Ceiling-Mount

**SPS Speaker Strobe** 6.8 in Dia. × 4.7 in D (including lens and speaker)

**SPSV Speaker Strobe** 6.8 in Dia. × 4.8 in D (including lens and speaker)

**SP Speaker** 6.8 in Dia. × 2.8 in D

**SPV Speaker** 6.8 in Dia. × 2.9 in D

## Electrical/Operating Specifications

**Nominal Voltage (speakers)** 25 Volts or 70.7 Volts (nominal)

**Maximum Supervisory Voltage (speakers)** 50 VDC

**Strobe Flash Rate** 1 flash per second

**Nominal Voltage (strobes)** Regulated 12 V DC/FWR or regulated 24 DC/FWR

**Operating Voltage Range (includes fire alarm panels with built in sync)** 8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)

**Operating Voltage with MDL Sync Module** 9 to 17.5 V (12 V nominal) or 17 to 33 V (24 V nominal)

**Frequency Range** 400 to 4,000 Hz

**Power** ¼, ½, 1, 2 watts

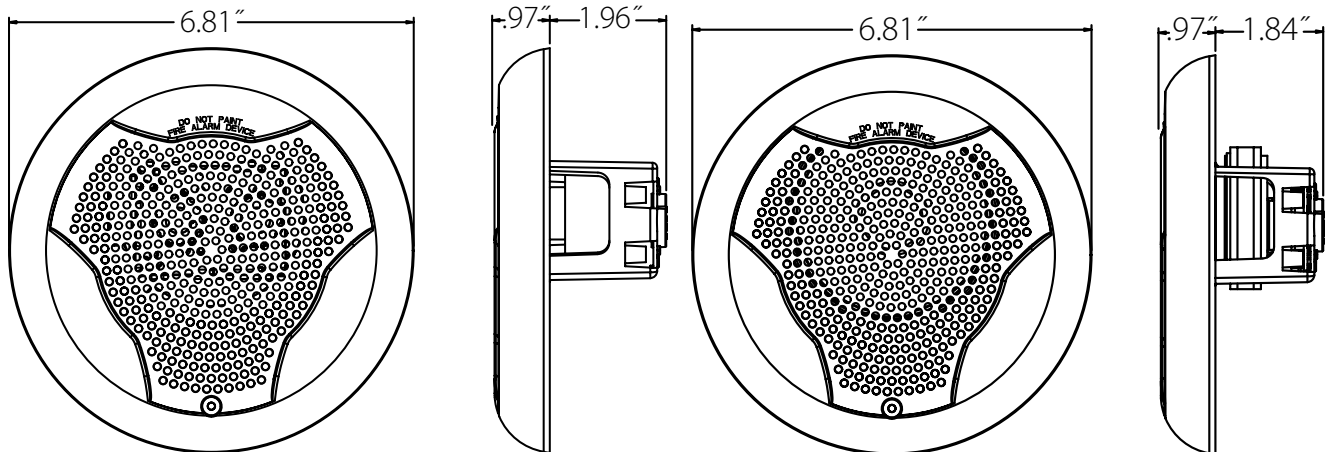
## UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)					
	Candela	8 to 17.5 Volts		16 to 33 Volts	
		DC	FWR	DC	FWR
<b>Standard</b>	15	123	128	66	71
<b>Candela Range</b>	15/75	142	148	77	81
	30	NA	NA	94	96
	75	NA	NA	158	153
	95	NA	NA	181	176
	110	NA	NA	202	195
	115	NA	NA	210	205
<b>High</b>	135	NA	NA	228	207
<b>Candela Range</b>	150	NA	NA	246	220
	177	NA	NA	281	251
	185	NA	NA	286	258

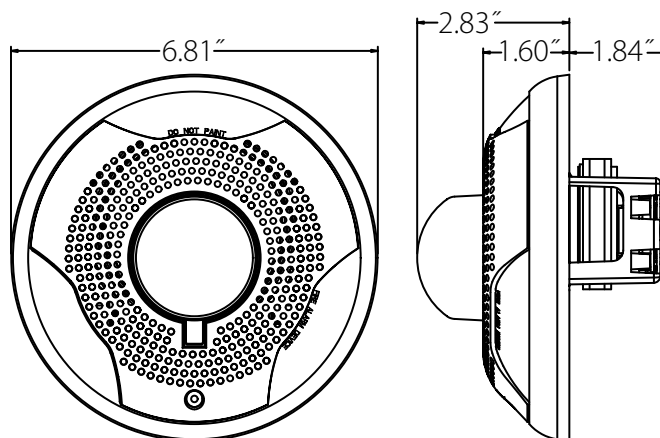
Sound Output				
UL Reverberant (dBA @ 10 ft.)	2W	1W	½ W	¼ W
Ceiling-Mount SPC Series	86	83	80	77
Ceiling-Mount SPCV Series	90	87	84	81
Ceiling-Mount SPSC Series	85	82	79	76
Ceiling-Mount SPSCV Series	89	86	83	80

## Dimensions



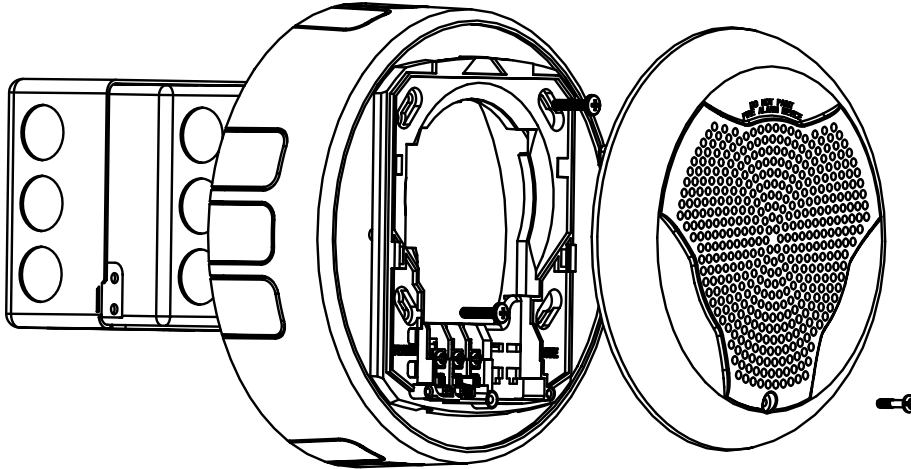
Ceiling-Mount SPV Speaker

Ceiling-Mount SP Speaker



Ceiling-Mount SPS Speaker Strobe

## Surface Mounting



Ceiling-Mount Speaker with SPBBSCW Back Box Skirt

## Ordering Information for SpectrAlert® Advance Speakers and Speaker Strobes

Ceiling Mount		
White	Red	Description
SPCW	SPCR	Speaker only
SPCWW	SPCRV	Speaker only, High dB
SPSCW*	SPSCR	Speaker Strobe, Selectable Candela (15, 15/75, 30, 50, 75, 95, 110, 115)
SPSCWH*	SPSCRH	Speaker Strobe, Selectable Candela, High cd (135, 150, 177, 185)
SPSCWW*	SPSCRV	Speaker Strobe, Selectable Candela (15, 15/75, 30, 75, 95, 110, 115), High dB
SPSCWH*	SPSCR VH	Speaker Strobe, Selectable Candela, High dB, High cd (135, 150, 177, 185)
Accessories		
White	Red	Description
RFPW	RFP	7 in x 9.5 in Retrofit Plate
SPBBSCW	SPBBSC	Ceiling Mount Back Box Skirt
TRCW	TRC	Ceiling Mount Trim Ring

\* Add -P to model number for plain housing (no "FIRE" marking on the cover) e.g. SPSCW-P



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AVDS00700 • 6/11 • #2808



## Outdoor, Selectable-Output Speaker Strobes and Dual-Voltage Evacuation Speakers for Wall Applications

*SpectrAlert® Advance outdoor, selectable-output speaker strobes and dual-voltage evacuation speakers meet virtually any outdoor application requirement.*

### Features

- Weatherproof per NEMA 4X, IP56
- Rated from -40°F to 151°F
- Plug-in design reduces ground faults
- Universal mounting plate with onboard shorting spring that tests wiring continuity before devices are installed
- Field-selectable candela settings: 15, 15/75, 30, 75, 95, 110, 115, 135, 150, 177, and 185
- Automatic selection of 12- or 24-volt operation at 15 and 15/75 candela
- Rotary switch for speaker voltage (25 and 70.7 Vrms) and power settings (1/4, 1/2, 1 and 2 watts)
- Compatible with System Sensor synchronization protocol and legacy SpectrAlert products
- Tamper-resistant construction

### Agency Listings



**SPECTRAlert**  
**ADVANCE**

**SpectrAlert Advance** offers the broadest line of outdoor speakers and speaker strobes in the industry. From metal and plastic outdoor back boxes, to white and red plastic housings, to wall and ceiling mounting options, SpectrAlert Advance can meet virtually any application requirement.

Wall-mount outdoor speakers and speaker strobes can be used indoors or outdoors in wet or dry applications, and can provide reliable operation from -40°F to 151°F. These speakers provide a broad frequency response range, low harmonic distortion and maintain a high sound pressure level at all tap settings to provide accurate and intelligible broadcast of evacuation messages.

Like the entire SpectrAlert Advance line, wall-mount outdoor speakers and speaker strobes include a variety of features that increase application flexibility and simplify installation. First, field-selectable settings, including candela, speaker voltage and power settings, and automatic selection of 12- or 24-volt operation enable installers to easily adapt devices to meet requirements.

Next, these devices use a universal mounting plate with an onboard shorting spring that ensures wiring continuity before devices are installed, so installers can verify proper wiring without mounting the devices and exposing them to potential construction damage. Once the plates are mounted, all SpectrAlert Advance devices utilize a plug-in design with a single captured screw to speed installation and virtually eliminate costly ground faults.

Outdoor devices ship with weatherproof plastic back boxes (metal back boxes are available separately) that accommodate in-and-out wiring for daisy chaining devices. Plastic back boxes feature removable side flanges and improved resistance to saltwater corrosion. Knock-outs located on the back eliminate the need to drill holes for screw-in mounting. Plastic and metal weatherproof back boxes come with 3/4-inch top and bottom conduit entries and 3/4-inch knock-outs at the back. A screw-in NPT plug with an O-ring gasket for a watertight seal is included with each back box.

# SpectrAlert® Advance Outdoor Speaker and Speaker Strobe Specifications

## Architectural/Engineering Specifications

### General

SpectrAlert Advance outdoor speakers and speaker strobes shall mount to a weatherproof back box. A universal mounting plate shall be used for mounting ceiling and wall products. The notification appliance circuit and amplifier wiring shall terminate at the universal mounting plate. Also, SpectrAlert Advance speaker strobes, when used with the Sync-Circuit™ Module accessory, shall be powered from a non-coded notification appliance circuit output and shall operate on a nominal 12 or 24 volts. When used with the Sync-Circuit Module, 12-volt-rated notification appliance circuit outputs shall operate between 9 and 17.5 volts; 24-volt-rated notification appliance circuit outputs shall operate between 17 and 33 volts. Outdoor SpectrAlert Advance products shall operate between -40°F and 151°F from a regulated DC, or full-wave rectified, unfiltered power supply.

### Speaker

Speaker shall be a System Sensor SpectrAlert Advance Model \_\_\_\_\_ dual-voltage transformer speaker capable of operating at 25.0 or 70.7 nominal Vrms. Speaker shall be listed to Underwriters Laboratories Standard S4048 for outdoor fire protective signaling systems. Speaker shall have a frequency range of 400 to 4,000 Hz and shall have an operating temperature from -40°F to 150.8°F. Speaker shall have power taps and wattage settings that are selected by rotary switches. The speaker must be installed with its weatherproof back box in order to remain outdoor approved per UL listing S4048. The speaker shall be suitable for use in air handling spaces and wet environments.

### Speaker Strobe Combination

The speaker strobe shall be a System Sensor Model \_\_\_\_\_ listed to UL 1638 and UL 1480 and be approved for fire protective signaling systems. Speaker shall be capable of operating at 25.0 or 70.7 nominal Vrms and shall have a frequency range of 400 to 4,000 Hz. Speaker shall have power taps that are selected by rotary switch. The strobe shall consist of a xenon flash tube with associated lens/reflector system and operate on either 12 or 24 volts. The strobe shall also feature selectable candela output, providing options for 15 or 15/75 candela when operating on 12 volts and 15, 15/75, 30, 75, 110, 115, 135, 150, 177 or 185 candela when operating on 24 volts. The strobe shall comply with the Americans with Disabilities Act requirement for visible signaling appliances, flashing at 1 Hz over the strobe's entire operating voltage range. The speaker strobe must be installed with its weatherproof back box in order to remain outdoor approved per UL. The speaker strobe shall be suitable for use in wet environments.

## Physical Specifications

<b>Operating Temperature</b>	-40°F to 151°F (-40°C to 66°C)
------------------------------	--------------------------------

### Dimensions, Wall-Mount

<b>SPS Speaker Strobe</b>	6.0" L x 5.0" W x 4.7" D (including lens and speaker)
---------------------------	---

<b>SP Speaker</b>	6.0" L x 5.0" W x 2.9" D
-------------------	--------------------------

<b>Dimensions, Wall-Mount Weatherproof Back Box</b>	6.5" L x 5.5" H x 2.9" D
---	--------------------------

## Electrical/Operating Specifications

<b>Nominal Voltage (speakers)</b>	25 V or 70.7 V (nominal)
-----------------------------------	--------------------------

<b>Maximum Supervisory Voltage (speakers)</b>	50 VDC
---	--------

<b>Strobe Flash Rate</b>	1 flash per second
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<b>Nominal Voltage (strobes)</b>	Regulated 12 VDC/FWR or regulated 24 DC/FWR
----------------------------------	---

<b>Operating Voltage Range (includes fire alarm panels with built in sync)</b>	8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
--	---

<b>Operating Voltage with MDL Sync Module</b>	9 to 17.5 V (12 V nominal) or 17 to 33 V (24 V nominal)
---	---

<b>Frequency Range</b>	400 to 4,000 Hz
------------------------	-----------------

<b>Power</b>	¼, ½, 1, 2 watts
--------------	------------------

## UL Current Draw Data

UL Max. Strobe Current Draw (mA RMS)					
	Candela	8 to 17.5 Volts		16 to 33 Volts	
		DC	FWR	DC	FWR
<b>Standard Candela Range</b>	15	123	128	66	71
	15/75	142	148	77	81
	30	NA	NA	94	96
	75	NA	NA	158	153
	95	NA	NA	181	176
	110	NA	NA	202	195
<b>High Candela Range</b>	115	NA	NA	210	205
	135	NA	NA	228	207
	150	NA	NA	246	220
	177	NA	NA	281	251
	185	NA	NA	286	258
	185	NA	NA	286	258

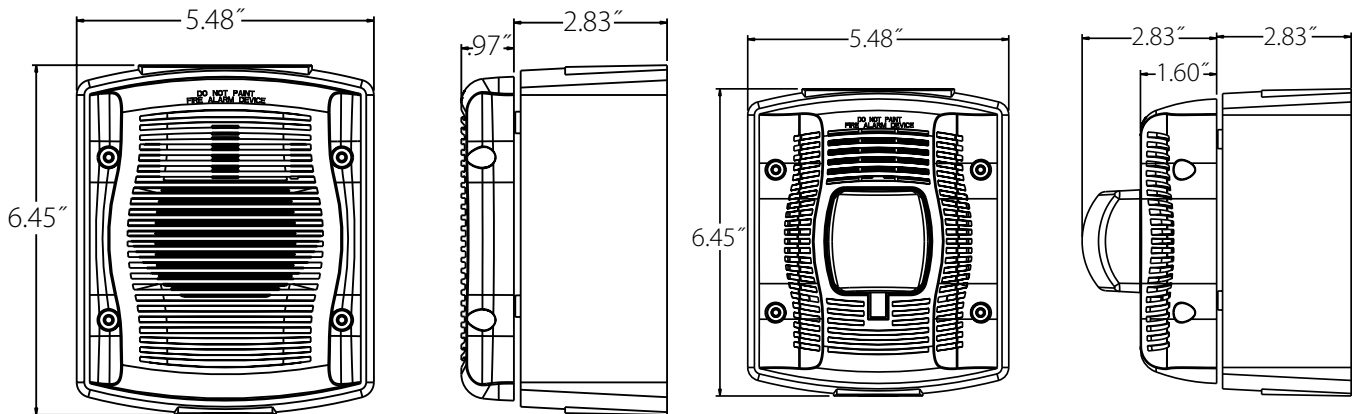
Sound Output				
UL Reverberant (dBA @ 10 ft.)	2W	1W	½ W	¼ W
<b>Outdoor Speaker</b>	90	87	84	81
<b>Outdoor Speaker/Strobe</b>	89	86	83	80

## Candela Derating

For K series products used at low temperatures, listed candela ratings must be reduced in accordance with this table.

Strobe Output (cd)	
Listed Candela	Candela rating at -40°F
15	Do not use below 32°F
15/75	
30	
75	44
95	70
110	110
115	115
135	135
150	150
177	177
185	185

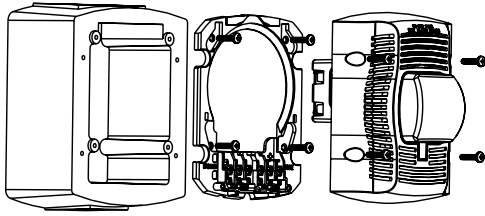
## Dimensions



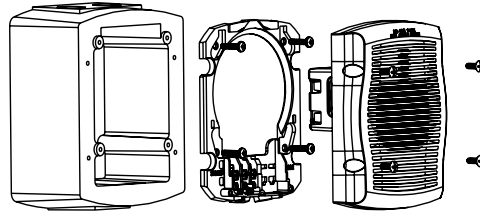
Wall-Mount Outdoor Speaker

Wall-Mount Outdoor Speaker Strobe

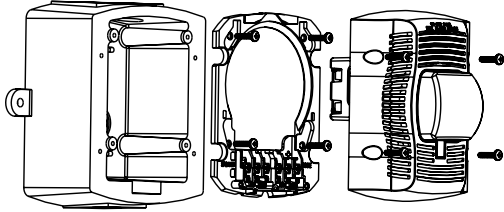
## Surface Mounting



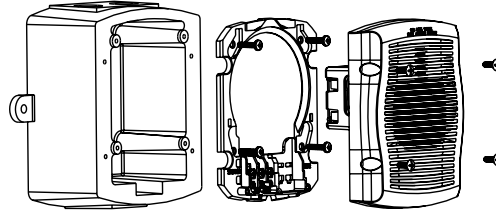
Wall-Mount Speaker Strobe with Plastic Weatherproof Back Box



Wall-Mount Speaker with Plastic Weatherproof Back Box



Wall-Mount Speaker Strobe with Metal Weatherproof Back Box



Wall-Mount Speaker with Metal Weatherproof Back Box

## Ordering Information for SpectrAlert® Advance Outdoor Speakers and Speaker Strobes

Wall Mount		
White	Red	Description
SPWK*	SPRK*	Outdoor Speaker (includes plastic weatherproof back box)
SPSWK*†	SPSRK*†	Outdoor Speaker Strobe, Selectable Candela (15, 15/75, 30, 75, 95, 110, 115) (includes plastic weatherproof back box)
—	SPSRHK	Outdoor Speaker Strobe, Selectable Candela (135,150,177,185) (Includes plastic weatherproof back box)
Accessories		
White	Red	Description
MWBBW	MWBB	Wall, Metal Weatherproof Back Box

### Notes:

\*Add "-R" to model number for weatherproof replacement device (no back box included), e.g., SPWK-R.

†Add "-P" to model number for plain housing (no "FIRE" marking on cover), e.g., SPSWK-P.



3825 Ohio Avenue • St. Charles, IL 60174  
Phone: 800-SENSOR2 • Fax: 630-377-6495

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Product specifications subject to change without notice. Visit [systemsensor.com](http://systemsensor.com) for current product information, including the latest version of this data sheet.  
AVDS01000 • 6/11 • #2811



CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION  
OFFICE OF THE STATE FIRE MARSHAL  
FIRE ENGINEERING - BUILDING MATERIALS LISTING PROGRAM



# LISTING SERVICE

**LISTING No.** 7320-1653:0201

Page 1 of 1

**CATEGORY:** 7320 -- SPEAKERS

**LISTEE:** System Sensor, Unincorporated Div of Honeywell Int'l Inc. 3825 Ohio Ave, St. Charles, IL 60174  
Contact: Vladimir Kireyev (203) 484-6277 Fax (203) 484-7309  
Email: Vladimir.Kireyev@honeywell.com

**DESIGN:** Models SPR,SPW,SPRV, and SPWV SpectrAlert Speakers - Rectangular enclosure.  
Models SPCW, SPCR, SPCWV, and SPCRV SpectrAlert Speakers with round enclosure.  
Models SPSR, SPSRH, SPSW, SPSW-ALERT, SPSW-CLR-ALERT, \*SPSWK-CLR-ALERT, SPSWH, SPSRV, and SPSWV SpectrAlert Speaker/Strobe with rectangular enclosure. Models SPSCR, SPSCRH, SPSCW, \*SPSCWK-CLR-ALERT, SPSCWH, SPSCRV, SPSCRVH, SPSCWV, and SPSCWVH SpectrAlert Speaker/Strobe with round enclosure. Model SPSCW-CLR-ALERT Speaker/Strobe. Model SPSW-ALERT has amber lens and is intended for non-fire use.  
All models identified are intended for indoor use mounted on the wall or ceiling. Models with a "K" in the suffix are suitable for indoor or outdoor use with an operating temperature rating of -40°C to +66°C (-40°F to +151°F) and have a NEMA 4X enclosure rating when used with models PWBB, PWBBW (wall) or the model PWBBCW (ceiling) plastic weatherproof back boxes or with Model MWBBW (Wall), MWBB (Wall) or MWBBCW (Ceiling) metal weatherproof back boxes. Models with a " - P" in the suffix have plain housings with no lettering on the enclosure. Models not containing " - P", in the suffix have English lettering reading "FIRE" on the housing. Refer to listee's data sheet for additional detailed product description and operational considerations.

**RATING:** Nominal Voltage: 25 Vrms or 70 Vrms  
Power Settings: ¼, ½, 1, 2 Watts  
Frequency Range: 400 - 4000 Hz

**INSTALLATION:** In accordance with listee's printed installation instructions, NFPA 72, applicable codes & ordinances and in a manner acceptable to the authority having jurisdiction.

**MARKING:** Listee's name, model number, electrical rating and UL label.

**APPROVAL:** Listed as speaker/strobes when used with separately listed compatible fire alarm control units. Suitable for wall or ceiling mount.  
These speaker/strobes do not generate a distinctive three-pulse temporal code pattern (for total evacuation) as required per NFPA 72, 2010 edition. If required, the appliances must be used with a fire alarm control unit that can generate the temporal pattern signal.

\*Corrected 02-06-12 bh



This listing is based upon technical data submitted by the applicant. CSFM Fire Engineering staff has reviewed the test results and/or other data but does not make an independent verification of any claims. This listing is not an endorsement or recommendation of the item listed. This listing should not be used to verify correct operational requirements or installation criteria. Refer to listee's data sheet, installation instructions and/or other

Date Issued: **July 01, 2018**

Listing Expires **June 30, 2019**

Authorized By: **DAVID CASTILLO, Program Coordinator**  
Fire Engineering Division

SECTION 311000 - SITE CLEARING

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Removal of vegetation, grass, grass roots, shrubs, tree stumps, trees, upturned stumps, weed growth, tree roots, brush, masonry, concrete, rubbish, debris and other materials.
2. Removal of concrete and bituminous surfaces.
3. Removal of existing fences and gates.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 2200 - Grading.
3. Section 31 2316 - Excavation and Fill for Pavement
4. Section 31 2323 - Excavation and Fill for Utilities.
5. Section 31 2326 - Base Course.
7. Section 32 3113 - Chain Link Fences and Gates.

1.02 SUBMITTALS

- A. Shop Drawings: Submit site plan indicating extent of site clearing.

1.03 QUALITY ASSURANCE

- A. Comply with Standard Specifications for Public Works Construction, current edition, as a minimum requirement.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 TREE AND STUMP REMOVAL

- A. Remove trees and stumps indicated or required to be removed. Remove trees, together with bulk of roots, to a minimum depth of 4 feet below required grade, and within a radius of approximately 7 feet beyond perimeter of trunk at grade.
- B. Fill and compact excavation from tree and stump removal. Fill in 6 inch layers, each compacted to 90 percent of maximum density in accordance with ASTM D1557.
1. Back filling shall not commence until the excavation is inspected and tested.

### 3.02 CONCRETE AND BITUMINOUS SURFACING REMOVAL

- A. Break up and completely remove existing concrete surfacing, curbs, gutters, walks and bituminous surfacing to indicated limits. Cutting shall be performed to a neat and even line with proper tools or a concrete cutting saw. Minimum depth of cut shall be 1 1/2-inch, unless otherwise indicated. Remove concrete broken beyond the indicated limits to the nearest joint or score line and replace with new concrete to match existing.

### 3.03 FENCING

- A. Existing fences scheduled to remain may be removed to facilitate the Work, provided they are installed to their original condition in accordance with requirements of Section 32 3113 - Chain Link Fences and Gates.
- B. Fencing indicated to be removed and not reinstalled shall be completely removed, including footings. Fill and compact excavations.
- C. Install chain link fencing indicated to be relocated or reset in accordance with applicable requirements specified under Section 32 3113 - Chain Link Fences and Gates.

### 3.04 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 312200 - GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. General exterior grading, cutting and filling, including grading for building area, paving, planting areas, banks and hillsides.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 1000 - Site Clearing.
3. Section 31 2316 - Excavation and Fill for Pavement.
4. Section 31 2323 - Excavation and Fill for Utilities.
5. Section 31 2326 - Base Course.

1.02 PROJECT REQUIREMENTS

A. General:

1. Fees: Pay as required by authorities having jurisdiction over the area.
2. Bonds: Post as required by authorities having jurisdiction over the area.
3. Haul Routes and Restrictions: Comply with requirements of authorities having jurisdiction over the area.
4. Before grading, contact Underground Service Alert of Southern California (USASC) for information on public buried utilities and pipelines. Retain the services of an underground utility locator for on-site utilities.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials shall conform to requirements specified in this and related sections.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect and maintain installed stakes until their removal is required for the Work. Provide replacement grade or location stakes lost or disturbed.
- B. Install grade stakes and compare to indicated grades. If discrepancies are found between existing grades and grades indicated on Drawings, do not proceed until discrepancies are resolved.

3.02 ROUGH AND FINE GRADING

- A. Rough grade area sufficiently high to require cutting by fine grading:
  - 1. Grade area for bituminous surfacing and other paving to the indicated grades, equal to the section of the indicated base and pavement.
  - 2. Slope banks to required finish grades as cut progresses or leave cuts full and finish grade by mechanical equipment to provide grades and soil densities indicated on the Drawings.
  - 3. Rough grade, fill and compact banks beyond indicated finish grades. Finish grade banks and slopes to indicated grades and specified soil densities.
  - 4. Grade Only Areas: In areas not indicated to receive pavement, rough grade to approximate finish grades and then scarify, moisten and roll to obtain required density and indicated finish grades.
  - 5. Tolerances: Finish grades shall be within a tolerance of 0.05 inch per foot above or below grades indicated. Provide an average grade as indicated.
  
- B. Base or Subgrade:
  - 1. After subgrade has been constructed to approximate required grades, scarify to a depth of at least 6 inches:
    - a. After scarifying, process loosened material to a finely divided condition and adjust moisture content to optimum condition by addition of water, addition and blending of dry suitable material, or by drying of existing material.
    - b. Subgrade material shall be compacted by tamping, sheepsfoot rollers or pneumatic tire rollers. Required relative compaction shall be [90] percent minimum for the top 6 inches below subgrade.
    - c. Install base course in accordance with Section 31 2326 - Base Course.
  - 2. Tolerance of completed grades of base or subgrade shall not vary more than 0.03 inch per foot from grades indicated. Provide an average grade as indicated.

3.03 SHORING

- A. Provide shoring as necessary to properly and safely support earth sides of excavations, and existing curbs, sidewalks, gutter, drives and stairs, against movement and collapse.
- B. Design and Calculations: Provide in accordance with requirement of CalOHS A.
- C. Remove shoring upon completion of the Work of this section or when no longer needed unless required otherwise by authorities having jurisdiction.

3.04 EXCESS MATERIAL DISPOSAL

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 312316 - EXCAVATION AND FILL FOR PAVING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
  1. Excavating, backfill, and compacting for paved areas.
  2. Installation of fill materials.
- B. Related Requirements:
  1. Division 01 - General Requirements.
  2. Section 31 1000 - Site Clearing.
  3. Section 31 2200 - Grading.
  4. Section 31 2323 - Excavation and Fill for Utilities.
  5. Section 31 2326 - Base Course.
  6. Section 32 0117 - Pavement Repair.
  7. Section 32 1216 - Asphalt Paving.
  8. Section 32 1313 - Site Concrete Work.

1.02 PROJECT REQUIREMENTS

- A. Import and Export of Earth Materials:
  1. Fees: Pay as required by authorities having jurisdiction over the area.
  2. Bonds: Post as required by authorities having jurisdiction over the area.
  3. Haul Routes and Restrictions: Comply with requirements of the OPUSD, City of Oak Park, and authorities having jurisdiction over the area.

1.03 SUBMITTALS

- A. Imported Soils: A geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain initial product Sample for testing in accordance with the terms of PART 3 of this section.

1.04 QUALITY ASSURANCE

- A. Comply with Standard Specifications for Public Works Construction, current edition, except as modified herein.

1.05 PROJECT CONDITIONS

- A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.
- B. A copy of the foundation investigation and soils report is available for examination at the Owner’s office during regular office hours.

PART 2 - PRODUCTS

2.01 BASE MATERIALS

- A. Concrete Slabs On Grade: Provide “Crushed Aggregate Base “as specified in the Standard Specifications for Public Works Construction, Section 200: “Rock Materials,” with ¾ inch maximum size aggregates. Provide 4-inch thick base, unless noted otherwise.
- B. Bituminous Surfacing: As indicated on Drawings and specified in Section 31 2326 - Base Course.

2.02 FILL AND BACKFILL MATERIALS

- A. Fill and backfill materials shall be previously excavated materials or imported fill material, free of clods and stones larger than 3-inch, foreign materials, vegetable growths, sod, expansive soils, rubbish and debris. Material shall conform to these specified requirements and related sections.
- B. Fill material exhibiting a wide variation in consistency and moisture content shall be blended or aerated to stabilize and upgrade the material.
- C. Imported Fill Material:
  - 1. Provide suitable materials obtained from Project site excavations for earthwork and fill materials. If excavated materials are not of suitable quality or sufficient quantity, import additional materials as necessary.
  - 2. Imported fill shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing 200 mesh sieve. Material shall have a coefficient of expansion of not more than 2 percent from air dry to optimum moisture content and not more than 6 percent from air dry to saturation. Imported material shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.
- D. Other Fill Materials: Brick rubble and broken concrete originating from the Project site may be legally disposed of off the Project site or incorporated in fill, if reviewed by a geotechnical engineer, retained by the Owner as an Owner Consultant. Unless otherwise required, no such materials may be imported from outside the Project site.
- E. Permeable Backfill:
  - 1. Provide permeable backfill material behind retaining structures consisting of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations of these materials conforming to the following gradations:

Sieve Size:	Percentage Passing:
3/4 inch (19mm)	100
3/8 inch (10mm)	80 to 100
No. 100	0 to 8
No. 200	0 to 3

2. Those portions of fill material passing a No. 4 sieve shall provide a sand equivalent of at least 60.
3. Provided backing for weep holes shall consist of two cubic feet of aggregate in burlap sacks, securely tied. Aggregate shall conform to requirements for No. 3 concrete aggregate as specified in subsection 200-1.4 of the Standard Specifications for Public Works Construction.
4. Permeable Backfill Alternate Materials: Instead of the materials specified for retaining structures backfill, a drainage matting system, Miradrain by Mirafi, Inc., or equal, may be provided if reviewed by the Architect.

### PART 3 - EXECUTION

#### 3.01 SITE PREPARATION

- A. Clear the Project site as required in Section 31 1000 - Site Clearing.

#### 3.02 PROTECTION

- A. Protect and guard excavations against danger to life, limb, and property as required by, but not limited to, Cal-OSHA regulations.
- B. Protect adjacent existing improvements including landscaping against damage.

#### 3.03 EXISTING UTILITY LINES

- A. Protect existing utility lines from damage or displacement.
- B. Remove conduits or pipes not in service, exposed during Work, unless a minimum cover of 2 feet is provided. Remove concrete, clay or other non-metallic pipe over 8 inches in diameter, unless otherwise indicated.

#### 3.04 EXCAVATION

- A. Unclassified Excavations: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.

#### 3.05 FILL

- A. Unclassified Fill and Compaction: Comply with the Standard Specifications for Public Works Construction, Section 300: "Earthwork," except as modified herein.
- B. Provide fill materials as specified in Part 2 - Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.
- C. Imported fill materials shall be sampled by a geotechnical engineer, retained by the Owner as an Owner Consultant, for compliance with the requirements of Part 2 of this Section.



- D. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall submit samples to a DSA approved independent approved testing laboratory for testing.
- E. Initial sampling shall be performed by the geotechnical engineer, retained by the Owner as an Owner Consultant, before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain both the initial and additional samples from the identified site and shall submit samples to the approved independent testing laboratory for testing.
- F. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing tested for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.
- G. The independent approved testing laboratory shall perform the required tests and report results of tests noting if the tested material passed or failed such tests and shall furnish copies to the Project Inspector, Architect, Owner’s Representative, DSA, Contractor, and others as required. Report shall state tests were conducted under the responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, CBC, and the DSA. Upon completion of the Work of this section, the independent testing laboratory and geotechnical engineer shall submit a verified report to the DSA as required by CBC.
- H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.
- I. Upon completion of import operations, provide the Owner’s Representative a certification statement attesting that imported material has been obtained from the identified source site.

3.06 INSTALLATION OF MATERIALS

- A. Fill or backfill materials shall be installed in horizontal layers of 6 inches, unless otherwise required. Each layer shall be evenly placed and moistened or aerated as necessary. Unless otherwise reviewed by the geotechnical engineer, retained by the Owner as an Owner Consultant, each layer of fill material shall cover the length and width of the area to be filled before the next layer of material is installed. Top surface of each layer shall be installed to an approximate level with a crown or crossfall of at least 1 in 50, but no more than 1 in 20. Provide adequate drainage at all times during construction of the Work of this section.

3.07 COMPACTING

- A. Each layer of fill material shall be compacted by tamping, sheepsfoot rollers, or pneumatic-tired rollers to provide specified relative compaction. At inaccessible locations, provide specified compaction by manually held, operated and directed compaction equipment.

- B. Unless otherwise indicated, compact each layer of earth fill to a relative compaction of at least 90 percent.
- C. When fill materials, or a combination of fill materials, are encountered or provided which develop densely packed surfaces as a result of installation or compacting operations, scarify each compacted layer before installing the next succeeding layer.

3.08 INSPECTION AND TESTING

- A. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavations, sample material quality as required in Part 2, and observe installation and compaction of fill materials.
- B. The geotechnical engineer, retained by the Owner as an Owner Consultant, will sample imported fill materials from their designated source before delivery to the Project site.
- C. Installation of backfill shall be observed by the geotechnical engineer, retained by the Owner as an Owner Consultant.
- D. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavation Work before the installation of fill and/or other materials.
- E. Compaction: Test compaction in accordance with ASTM D1557, Method C.

3.09 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.10 CLEANING

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

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SECTION 312323 - EXCAVATION AND FILL FOR UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Excavating, backfilling, and compacting utility trenches such as water, gas, irrigation, storm drain, sewer lines, concrete-encased conduits, and manholes, vaults, valve boxes, catch basins, underground tanks, thrust blocks, yard boxes, pull boxes and other utility appurtenances.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 1000 - Site Clearing.
3. Section 31 2200 - Grading.
4. Section 31 2316 - Excavation and Fill for Paving.
5. Section 32 0117 - Pavement Repair.
6. Section 32 1313 - Site Concrete Work.
7. Section 33 1100 - Site Water Distribution Utilities.
8. Section 33 3000 - Site Sanitary Sewer Utilities.
9. Section 33 4000 - Storm Drainage Utilities.
10. Division 22 - Plumbing.
11. Division 26 - Electrical.

1.02 PROJECT REQUIREMENTS

A. Import and Export of Earth Materials:

1. Fees: Pay as required by authorities having jurisdiction over the area.
2. Bonds: Post as required by authorities having jurisdiction over the area.
3. Haul Routes and Restrictions: Comply with requirements of OPUSD, City of Oak Park, and authorities having jurisdiction over the area.

1.03 SUBMITTALS

- A. Imported Soil: A geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain initial product Sample for testing in accordance with the terms of PART 3 of this section.

1.04 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement: Standard Specifications for Public Works construction, current edition except as modified herein.

1.05 PROJECT CONDITIONS

- A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.
- B. A copy of the foundation investigation and soils report is available for examination at the Owner's office during regular business hours.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Bedding material from trench bottom to one foot above the pipe:
  - 1. Sand, gravel, crushed aggregate or native free-draining granular material providing a sand equivalent of at least 30 or a coefficient of permeability greater than 1.4 inches per hour.
  - 2. Sand complying with the Specifications for cement concrete aggregates.
- B. Backfill Materials:
  - 1. Excavated trench material to be installed for backfilling shall be clean, free of large clods, and stones larger than 2 ½-inch in any dimension.
  - 2. Cement-sand slurry shall be provided with one sack of cement per cubic yard of the mixture.
  - 3. Imported Fill Material: Imported fill material shall be a granular material with sufficient binder to form a firm and stable unyielding subgrade and shall not have more than 60 percent of fines passing a 200 mesh sieve. Material shall provide a coefficient of expansion of not more than two percent from air dry to optimum moisture content and not more than six percent from air dry to saturation. Imported materials shall be clean and free of rubbish, debris, and toxic or hazardous contaminants. Adobe or clay soils are not permitted.

## PART 3 - EXECUTION

### 3.01 GENERAL

- A. Before excavation, contact the "Underground Service Alert of Southern California" (USASC) for information on buried public utilities and pipelines. For on-site utilities retain an underground locating service.
- B. Barricade trenches, ditches, pits, sumps, and similar Work outside the barricaded working area with chain link and in accordance with Cal-OSHA standards and requirements.
- C. Saw-cut concrete or bituminous paving for trench installation.
- D. Trenches over 5 feet in depth shall conform to the Cal-OSHA.
- E. Where indicated and required to excavate in lawn areas, protect adjoining lawn areas outside of the Work area. Replace or install removed sod upon completion of backfill by

installing sod level with adjacent lawns. If installation of removed sod fails, furnish sod and install to match existing lawns.

- F. Backfill over excavations to the required elevations with earth, gravel, sand, or concrete and compact as required. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. Slope adjacent grades away from excavations to minimize entry of water.
- G. Do not install piping lengthwise under concrete walks without review by the Architect.
- H. Do not excavate trenches parallel to footings closer than 18 inches from the face of the footing or below a plane having a downward slope of two horizontal to one vertical, from a line 9 inches above bottom of footings.
  - 1. Unless otherwise indicated on Drawings, depth of excavations outside the buildings shall allow for a minimum coverage above top of pipe, tank, or conduit measured from the lowest adjoining finished grade, as follows:
 

Steel Pipe	24 inches below finished grade
Copper Water Tube	18 inches below finished grade
Cast-Iron Pressure Pipe	36 inches below finished grade
Plastic Pipe (other than waste)	30 inches below finished grade
Tanks or other structures	36 inches below finished grade
Soil, Sewer & Storm Drain	minimum 18 inches below finished grade, and as required for proper pitch and traffic load. (Install polypropylene sewer pipe with at least 24 inches coverage)
Irrigation Pipe:	nonpressure pipe 12 inches, pressure pipe 24 inches
  - 2. Trench width shall provide ample space for fitting and joining. Excavate for piping bells and fittings, bell and spigot pipe and other fittings.
- I. Unless indicated otherwise, excavate trenches to the required depths for utilities, such as pipes, conduit and tanks, with minimum allowances of 6 inches at the bottom and 6 inches at the sides for bedding of unprotected piping or as required for concrete encasement of conduits as indicated on Drawings. Grade bottom of trenches to a uniform smooth surface. Remove loose soil from the excavation before installing sand bedding or concrete encasement.
- J. Provide excavations free from standing water by pumping, draining, or providing protection against water intrusion. If soil becomes soft, soggy, or saturated, excavate to firm undisturbed soil and fill as required. Slope adjacent grades away from excavations to minimize entry of water.
- K. Provide a minimum clear dimension of 2 inches from sides of wall excavation to outer surfaces of buried pipes or conduits installed in the same trench or outside surfaces of containers and tanks.
- L. Do not install backfill until required inspections and testing is completed.

- M. Backfill electrical or other excavated utility trenches located outside of barricaded installation areas within 24 hours after inspection by the Project Inspector.
- N. Install backfill materials in layers not exceeding 4 inches in thickness and compact to 90 percent of the maximum density.
- O. If materials excavated from the Project site are not permitted for trench backfill in paved areas, backfill trenches with a cement-sand slurry mix. Install backfill to an elevation of the existing undisturbed grade plus one inch.
- P. Install and compact sand bedding to provide a uniform full length bearing under piping and conduits.
- Q. Where portions of existing structures, walks, paving, or other improvements are removed or cut for piping or conduit installation, replace the material with equal quality, finished to match adjoining existing improvements. Repair pavement as specified in Section 32 0117 - Pavement Repair.

### 3.02 IMPORT/EXPORT OF MATERIALS

- A. Provide fill materials as specified in Part 2- Products. If excavated materials from the Project site are not of required quality or sufficient quantity, import additional materials as necessary.
- B. Imported fill materials shall be sampled by a geotechnical engineer, retained by the Owner as an Owner Consultant, for compliance with the requirements of Part 2 of this section.
- D. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall perform the tests by utilizing an independent approved testing laboratory.
- E. Initial sampling shall be performed by the geotechnical engineer, retained by the Owner as an Owner Consultant, before importing material to the Project site. Identify the location of the source site in addition to the address, name of the person and/or entity responsible for the source site. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall obtain both the initial sample and additional samples from the identified site and shall submit all samples to the approved independent testing laboratory.
- F. The geotechnical engineer, retained by the Owner as an Owner Consultant, shall perform additional sampling during import operations. If the total quantity of import is determined to be greater than 1,000 cubic yards of material, one sample shall be obtained and submitted for testing for each 250 cubic yards of imported material. If the total quantity of import is determined to be less than 1,000 yards, one sample shall be obtained and submitted for testing for each 100 cubic yards of imported material.
- G. The independent approved testing laboratory shall perform the required tests and report results of all tests noting if the tested material passed or failed such tests and shall furnish copies to the Project Inspector, Architect, Owner's Representative, DSA, Contractor, and others as required. Report shall state tests were conducted under the

responsible charge of a licensed State of California professional engineer and the material was tested in accordance with applicable provisions of the Contract Documents, CBC and the DSA. Upon completion of the Work of this section, the independent testing laboratory and geotechnical engineer shall submit a verified report to the DSA as required by CBC.

- H. Bills of lading or equivalent documentation will be submitted to the Project Inspector on a daily basis.
- I. Upon completion of import operations, provide the Owner's Representative a certification statement attesting that imported material has been obtained from the identified source site.

### 3.03 INSPECTION AND TESTING

- A. The geotechnical engineer, retained by the Owner as an Owner Consultant, will inspect and test excavations, sample material quality as required in Part 2, observe installation and compaction of fill materials.
- B. Compaction test shall be performed in accordance with ASTM D1557, method "C."

### 3.04 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

### 3.05 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION



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## SECTION 312326 - BASE COURSE

## PART 1 - GENERAL

## 1.01 SUMMARY

## A. Section Includes:

1. Installation of base material.

## B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 1000 - Site Clearing.
3. Section 31 2200 - Grading.
4. Section 31 2316 - Excavation and Fill for Paving.
5. Section 31 2323 - Excavation and Fill for Utilities.
6. Section 32 0117 - Pavement Repair.
7. Section 32 1216 - Asphalt Paving.
8. Section 32 1313 - Site Concrete Work.

## 1.02 SUBMITTALS

- A. Prior to import, submit written certification to Owner's Representative that crushed Miscellaneous Base (CMB) does not contain Polychlorinated biphenyls (PCB) above laboratory detection limits when tested in accordance with EPA Method 8082, and obtain written approval from Owner prior to import at the subject site.
- B. Crushed aggregate base (CAB) shall consist of native rock without naturally occurring asbestos or recycled materials. The Contractor shall submit written documentation, which identifies the source, volume, and proposed transport date of the material for review and approval by Owner prior to importing the material. A statement on company letterhead from the source, stamped by either a California Professional Geologist or Engineer, which states that the subject materials are native rock, do not contain any recycled materials and that the source does not mine ultramafic materials, a source of natural occurring asbestos shall be included in the submittal to Owner. To be considered for a variance, the Contractor shall submit a documentation package, which includes all of the aforementioned information at least 48 hours in advance of planned import.
- C. Product Data: Submit material source, technical information and test data for base materials. Gradation and quality certifications shall be dated within 30 days of the submittal.
- D. Sample: Submit Sample of proposed base course material.

## 1.03 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

PART 2 - PRODUCTS

2.01 UNTREATED BASE MATERIALS

- A. The following base materials shall conform to the requirements of the Standard Specifications for Public Works Construction: Section 200 - Rock Materials.
  - 1. Crushed Aggregate Base.
  - 2. Crushed Miscellaneous Base.
    - a. CMB meeting requirements of Article 1.02, A, may be used on-site for pavement base only.
    - b. CMB may be used off-site when in accordance to the Greenbook.
- B. Materials generated on site shall not be used as a base course material.

2.02 SOURCE QUALITY CONTROL

- A. Sampling and testing of imported and/or exported crushed miscellaneous base (CMB) shall be performed in accordance with the following Table 1 schedule:

TABLE 1: MINIMUM SAMPLING FREQUENCY	
Volume (CY)	Sampling Frequency
0 to 500	1 per 100 Cubic Yards
501 to 1,000	1 per 250 Cubic Yards
1,001 to 5,000	1 per 250 Cubic Yards for first 1,000 Cubic Yards 1 per 500 CY thereafter
5,001 to 20,000	12 samples for first 5,000 Cubic Yards 1 per 1,000 Cubic Yards thereafter
over 20,000	1 per 2,000 Cubic Yards for first 20,000 Cubic Yards 1 per 2,500 CY thereafter

2.03 MATERIAL APPROVAL

- A. Base material shall be inspected by the Project Inspector for gradation and material content prior to installation. The owner may choose to have additional tests performed by a geotechnical engineer, retained by the Owner, before installation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install base course material in layers not exceeding 4 inches in thickness, unless required otherwise. Grade and compact to indicated levels or grades, cut and fill, water and roll until the surface is hard and true to line, grade and required section. Provide a relative compaction of at least 95 percent, unless otherwise required.

- B. Grade base course to elevations indicated on Drawings, ready to receive surfacing, in accordance with Section 31 2200 - Grading.

3.02 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

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## SECTION 320117 - PAVEMENT REPAIR

## PART 1 - GENERAL

## 1.01 SUMMARY

## A. Section Includes:

1. Surfacing Repair: Areas removed for utility trenches, heaved by tree roots, cracked areas, protruding areas where pavement meets hard surfaces, depressed areas, holes and areas around new structures, and raveled bituminous pavement.
2. Areas heaved by tree roots, cracked areas, holes and trenches, and areas around new structures.

## B. Related Sections:

1. Division 01 - General Requirements.
2. Section 31 2200 - Grading.
3. Section 31 2316 - Excavation and Fill for Paving.
4. Section 31 2323 - Excavation and Fill for Utilities.
5. Section 31 2326 - Base Course.
6. Section 32 1216 - Asphalt Paving.
7. Section 32 1313 - Site Concrete Work.

## 1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings indicating areas to be repaired.
- B. Product Data: Submit manufacturer's technical data for materials and products.

## 1.03 QUALITY ASSURANCE

- A. Comply with Standard Specifications for Public Works Construction, current edition.

## PART 2 - PRODUCTS

## 2.01 MATERIALS

- A. Base course materials: Section 31 2326 - Base Course.
- B. Asphalt paving materials: Section 32 1216 - Asphalt Paving.
- C. Concrete paving materials: Section 32 1313 – Site Concrete Work
- D. Headers: Section 32 1216 - Asphalt Paving.

## 2.02 MATERIALS

- A. Provide materials and products of the class, grade or type indicated, conforming to relevant provisions of Sections 201 – Concrete, Mortar and Related Materials and 203 -

Bituminous Materials of the latest Standard Specifications for Public Works Construction.

### PART 3 - EXECUTION

#### 3.01 PAVEMENT REMOVAL

- A. Remove bituminous and concrete pavement in accordance with applicable provisions of Section 300 - Earthwork of the Standard Specifications for Public Works Construction.
- B. Pavement Heaved By Roots: Remove pavement to limits of distortion and expose roots. Trim roots to provide at least 12-inch clearance to pavement.
- C. Remove protruding pavement surfaces flush with the surrounding grade using a suitable tool or equipment so that adjacent finishes are not blackened.
- D. Remove raveled and depressed pavement to limits indicated or required.
- E. Saw cut existing improvements, trim holes and trenches in bituminous and concrete pavement to permit mechanical hand tampers to compact the fill.
- F. Remove broken concrete by saw cutting. If the required cut line is within 30 inches of a score or joint line or edge, cut and remove to the score, joint line, or edge.

#### 3.02 EXCAVATING, BACKFILLING AND COMPACTING

- A. Conform to requirements in Section 31 2316 - Excavation and Fill for Paving or Section 31 2323 - Excavation and Fill for Utilities, as required.
- B. Where subgrade or base is deemed to be unstable or otherwise unsuitable, excavate such materials to firm earth, and replace with a required material. Install and compact fill materials in accordance with the requirements of related Specification sections.

#### 3.03 HEADERS

- A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.
- B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of the adjacent undisturbed grade.
- C. Fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid earth a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on centers with top of stakes set one inch below top of header. Provide a minimum of two 12d galvanized common nails through each stake.
- D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.

- E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.
- F. Provide additional stakes and devices as required to fasten headers.

### 3.04 BASE COURSE

- A. Unless otherwise indicated, base course shall be crushed aggregate base, fine grade, 3 inches thick or equal to thickness of the existing base, whichever is greater.
- B. Fill grade and compact as specified in Section 31 2200 - Grading.

### 3.05 RESURFACING

- A. Holes and Trenches: Remove loose dirt and backfill with cement-sand slurry allowing for surfacing one inch thicker than existing. Resurface flush with existing adjoining pavement installing the same type of materials and section provided in existing improvements.
- B. Other Areas: Other surface improvements damaged or removed shall be cut to a neat even line and excavated one inch below the bottom of the existing pavement. Resurface by following the original grades and installing the same type of materials provided in existing improvements.
- C. Where bituminous surfacing abuts concrete, masonry, walks or any paving surface, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth materials before asphalt cools.

### 3.06 REPAIRING AND RESEALING EXISTING SURFACES

- A. Preparation of Surfaces: Prior to filling cracks, clean existing bituminous surfacing of loose and foreign materials and coat with a film of asphalt emulsion.
- B. Repair of Existing Surfacing:
  - 1. Fill cracks  $\frac{1}{2}$  inch wide and less with RS-1 emulsion and silica sand or other required material. Cracks larger than  $\frac{1}{2}$  inch wide shall be filled with Type C2 Asphalt Concrete as specified. Cracks shall be filled to the level of adjacent surfacing.
  - 2. Where low areas, holes, or depressions occur in existing surfacing, repair with emulsified asphalt. Install material, strike off the emulsified asphalt with a straightedge flush with adjoining surfacing. Finish with a steel trowel, and after dehydration, compact by rolling or tamping.
- C. Testing: Flood test entire area in presence of the Project Inspector. Entire area tested shall be free of standing water or puddles.

### 3.07 CLEANING

- A. Remove all stains on the Project site and adjacent properties caused by or attributed to the Work of this section.



- B. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.08 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Paving for playground, parking areas, areas between buildings, synthetic track surfacing adjacent to planting and turf areas as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 31 2200 - Grading.
3. Section 32 0117 - Pavement Repair.
4. Section 31 2326 - Base Course.
5. Section 32 1313 - Site Concrete Work.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan indicating extent of paving and accessories.

B. Product Data: Manufacturer’s technical data for materials and products.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction.

1.04 PROJECT CONDITIONS

A. Information on Drawings or in soils report does not constitute a guarantee of accuracy or uniformity of soil conditions over the Project site.

B. A copy of the soils report is available for examination in the office of the Owner during regular office hours of the Owner.

PART 2 - PRODUCTS

2.01 BITUMINOUS MATERIALS

A. Provide materials of the class, grade, or type indicated on the Drawings, conforming to relevant provisions of Section 203 - Bituminous Materials of the Standard Specifications for Public Works Construction.

2.02 HEADERS

A. Concrete: Per specification Section 32 1313 - Site Concrete Work.

- B. Wood:
  - 1. Redwood, Construction Heart Grade, size 2 by 6, unless otherwise indicated.
  - 2. Stakes: 2 by 4 redwood or 2 by 3 Douglas fir, Construction Grade.
  - 3. Nails: Common, galvanized, 12d minimum.

### PART 3 - EXECUTION

#### 3.01 HEADERS

- A. Install headers along edge of bituminous surfacing abutting turf, earth, or planting area, unless indicated otherwise.
- B. Install headers so the bottom surface has continuous bearing on solid grade. Where excavation for headers is undercut, thoroughly tamp soil under the header. Compact backfill on both sides of header to the density of adjacent undisturbed earth.
- C. Where wood headers are indicated on drawing, fasten headers in place with redwood or Douglas fir stakes of length necessary to extend into solid grade a minimum of 12 inches. Stakes shall be of sound material, neatly pointed, driven vertically, and securely nailed to headers. Space stakes, not to exceed 4 feet on center with top of stakes set one inch below top of header. Provide a minimum of two 12d galvanized common nails through each stake.
- D. Remove existing headers where new surfacing is installed adjacent to existing surfacing.
- E. Install temporary headers at transverse joints of paving where continuous paving operations are not maintained.
- F. Provide additional stakes and anchorage as required to fasten headers in place.

#### 3.02 CONSTRUCTION OF ASPHALT CONCRETE PAVEMENT

- A. Thickness of Surfacing: Unless otherwise indicated on Drawings or specified, install bituminous surfacing to a compacted thickness of 2 inches.
- B. Provide surfacing material over base course as specified in Section 31 2326 - Base Course.
- C. Surfaces of walls, concrete, masonry, or existing bituminous surfacing indicated to be in direct contact with installed bituminous surfacing shall be cleaned, dried and uniformly coated with an asphaltic emulsion film.
- D. Thicken edges of bituminous surfacing that do not abut walls, concrete, or masonry, and edges joining existing bituminous surfaces. Remove headers at existing bituminous surfacing where new bituminous surfacing is to be installed. Thicken edges an additional 2 inches and taper to the indicated or specified thickness 6 inches back from such edges.
- E. At stairways, adjust thickness of paving such that the first tread is equal in height to all other treads.

- F. Provide adequate protection for concrete, planting areas, and other finish Work adjacent to areas indicated to receive bituminous surfacing.
- G. Placing:
1. Do not install bituminous surfacing when atmospheric temperature is below 40 degrees F; or when fog or other unsuitable weather conditions are present. Temperature of mixture at time of installation shall not be lower than 260 degrees F in warm weather or higher than 320 degrees F in cold weather.
  2. Where 2-inch or 3-inch thick surfacing is indicated or specified, install surfacing in one course. Where surfacing is indicated or specified 4 inches or more in thickness, except for thickened edges, install bituminous surfacing in courses of approximately equal thickness, each course not exceeding 2 ½ inches in thickness.
- H. Stakes or Screeds: Provide grade or screed stakes spaced not more than 15 feet apart in flow lines with grades of less than one percent. Continuous screeds may be provided instead of stakes.
- I. Spreading: Install bituminous surfacing in a manner to cause least possible handling of mixture. In open areas and wherever practicable, install by mechanical means with a self-propelled mechanical spreader. In confined or restricted areas, install mixture with hot shovels and rakes, and smooth with lutes.
- J. Joints: Provide vertical joints between successive runs. Install joints true to line, grade, and cross section. Lapped joints are not permitted.
- K. Rolling:
1. Finish roll with a self-propelled tandem roller weighing at least 8 tons. Break down roll with a self-propelled roller weighing between 1 ½ tons and 8 tons.
  2. Roll in a manner that preserves flow lines and the established finished grades. Break down roll in areas adjacent to flow lines parallel to flow lines. Break down roll after bituminous surfacing is installed without shoving or cracking of mixture under roller. Continue finish rolling until surfacing is unyielding, true to grade, and meets requirements for specified smoothness. Areas inaccessible to finish roller may be finish rolled with breakdown roller or tamped with hot tamping irons and smoothed with hot smoothing irons or hand roller.
  3. Where bituminous surfacing abuts concrete, masonry, walks or paving, tamp joint smooth, if necessary, as described above to obtain a uniformly even joint, true to line and grade. Tamp and smooth to properly compact.
  4. Compacted bituminous surfacing shall be provided with a bulk specific gravity of at least 2.31 when tested in accordance with ASTM D1188.

### 3.03 TOLERANCE

- A. Smoothness: Surface of bituminous surfacing after rolling, shall be even, smooth and uniform in texture with no voids or rock pockets, free of roller marks or other irregularities, and not varying by more than 0.03 foot, except at local depressions or raised areas as indicated, when a 10-foot straightedge is placed on surface.
- B. Grade: Finished grade shall not vary more than 0.02 foot above or below required grade. Variations within prescribed tolerance shall be compensating so that average grade and cross-section are provided.

- C. Premium paving tolerances and requirements for synthetic track:
  - 1. General: Test in-place asphalt concrete courses for compliance with requirements or thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Owner’s representative.
  - 2. Thickness: Tolerances for thickness shall be ¼ inch, plus or minus.
  - 3. Planarity: The asphalt substrate shall not vary from the planned cross slope by more than plus or minus 0.1 percent. The finished asphalt shall not vary, plus or minus, under a 10 feet straight edge greater than 1/8 inch. Flood test the surface with the use of a water truck. If, after 30 minutes on a 70 degree F day, “bird baths” are evident at a depth more than 1/8 inch repair using the best method of correction.
  - 4. Corrective Measures: Determine if the planarity, cross slopes, and general specifications have been met. If all of the conditions have been met notify the Owner in writing of the acceptance of the asphalt paving. [This notification must include the acceptance of the paving by the track surfacing contractor.]
  - 5. No slurry or fog seals are to be applied to areas of asphalt paving that are to receive synthetic track surfacing.

3.04 TESTING

- A. After first coat of surface seal has been installed and after a 24 hour period, the flood test shall be completed of the bituminous surfacing in presence of the Project Inspector. Repair areas of standing water or puddles and flood test locally; install surface seal and retest as necessary.

3.05 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.06 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 321313 - SITE CONCRETE WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Portland cement concrete pavement, concrete walks, curbs, gutters, trash pick-up area, ramps, fence post footings, sliding gate concrete tracks, catch basins, pipe bedding and encasements, thrust blocks, transition structures, flagpoles and light standard bases and footings, athletic equipment footings and equipment pads.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 03 2000 - Concrete Reinforcement.
3. Division 26 - Electrical.
4. Section 31 2200 - Grading.
5. Section 31 2316 - Excavation and Fill for Pavement.
6. Section 31 2326 - Base Course.
7. Section 32 0117 - Pavement Repair.
8. Section 32 1216 - Asphalt Paving
9. Section 32 3113 - Chain Link Fences and Gates.
10. Section 33 1100 - Site Water Distribution Utilities.
11. Section 33 3000 - Site Sanitary Sewer Utilities.
12. Section 33 4000 - Storm Drainage Utilities.

1.02 SUBMITTALS

- A. Shop Drawings: Submit plans, elevations and details of concrete site work.
- B. Product Data: Submit mix designs and manufacturer’s technical data for materials and products. Submit 3-inch by 3-inch concrete Sample of each specified color.
- C. Material Sample: Submit one concrete bumper to the Project Inspector for destructive testing.

1.03 QUALITY ASSURANCE

- A. Comply with Standard Specifications For Public Works Construction.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Concrete, Mortar and Related Materials: Comply with applicable provisions of Standard Specifications for Public Works Construction, Section 201 - Concrete, Mortar and Related Materials:
  - 1. Concrete: 28-day compressive strength 2,500 psi, unless specified otherwise.
  - 2. Reinforcing Mesh: ASTM A185, 4 by 4/W1.4 by W1.4 welded wire mesh.
  - 3. Expansion Joint Filler: Preformed expansion joint filler, bituminous type, complying with ASTM D994.
- B. Form Materials:
  - 1. Side forms: Douglas fir, Construction Grade or Better or metal forms.
  - 2. Stakes: Douglas fir, Construction Grade or Better or metal stakes.

PART 3 - EXECUTION

3.01 CONSTRUCTION OF FORMS FOR CAST-IN-PLACE STRUCTURES

- A. Concrete Pavement: Install Portland cement concrete pavement in compliance with the Standard Specifications for Public Works Construction, Section 302- Roadway Surfacing.
- B. Miscellaneous Exposed Concrete: Install concrete curbs, walks, gutters, cross gutters, access ramps, driveways, catch basins, yard boxes, vaults and similar structures, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.
- C. Exposed Concrete Bases: Install bases, such as for post, flagpole, light standards and similar bases, in compliance with the Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction.
- D. Post, flagpole, light standard footings below grade, underground conduit bedding, encasements, thrust blocks and similar structures may be placed \directly in excavations conforming to the required sizes.
- E. Reinforcement installation and concrete placement, surface finishes, curing and removal of forms shall be performed in compliance with applicable provisions of Standard Specifications for Public Works Construction, Section 303 - Concrete and Masonry Construction. Provide heavy broom finish at slopes exceeding six percent and medium broom finish at slopes up to six percent.

3.02 CLEAN UP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.03 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

SECTION 321313.1- DECORATIVE CONCRETE PAVING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes textured concrete paving, top cast finish.

1.02 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each type of exposed color, pattern, or texture indicated.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer of decorative concrete paving systems.
- B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups of decorative concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 60 inches by 60 inches of each type of finish.

PART 2 - PRODUCTS

2.01 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.02 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

2.03 STEEL REINFORCEMENT

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



- C. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 deformed bars; assembled with clips.
- D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

#### 2.04 CONCRETE MATERIALS

- A. Cementitious Materials:
  - 1. Portland Cement: ASTM C 150/C 150M, gray portland cement per geotechnical report.
- B. Normal-Weight Aggregates: ASTM C 33/C 33M, per geotechnical report, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
  - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C 260/C 260M.
- D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
- E. Water: Potable and complying with ASTM C 94/C 94M.

#### 2.05 FIBER REINFORCEMENT

- A. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.
- B. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches long.

#### 2.06 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

#### 2.07 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

- B. Polyethylene Film: ASTM D 4397, 1 mil thick, clear.

## 2.08 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301.
- B. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
- C. Concrete Mixtures: Normal-weight concrete.
  - 1. Compressive Strength (28 Days): Per geotechnical report
  - 2. Slump Limit: per geotechnical report, not less than 4 inches.

## 2.09 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Proof-roll prepared subbase surface below all decorative concrete paving to identify soft pockets and areas of excess yielding.

### 3.02 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.03 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

### 3.04 STEEL REINFORCEMENT INSTALLATION

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

### 3.05 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

### 3.06 CONCRETE PLACEMENT

- A. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- D. Screed paving surface with a straightedge and strike off.
- E. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

### 3.07 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

### 3.08 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. 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 before and during

finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Compound: Apply immediately after final finishing. 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.
  - 1. Cure concrete finished with pigmented mineral dry-shake hardener with a pigmented curing compound.

### 3.09 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117.

### 3.10 REPAIR AND PROTECTION

- A. Remove and replace decorative concrete paving that is broken or damaged or does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Detailing: Grind concrete "squeeze" left from tool placement. Color ground areas with slurry of color hardener mixed with water and bonding agent. Remove excess release agent with high-velocity blower.
- C. Protect decorative concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain decorative concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

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SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
  1. Parking stripes, markings and accessibility symbols.
  2. Exterior athletic court markings.
  3. Playground markings.
  4. Fire lane "No Parking."
  5. Curb marking and red curbs.
- B. Related Requirements:
  1. Division 01 - General Requirements.

1.02 SUBMITTALS

- A. Shop Drawings: Submit Shop Drawings, indicating location, extent, color and texture of markings.
- B. Material Samples: Submit color Samples.

1.03 PROJECT CONDITIONS

- A. Do not install markings when adverse weather conditions are forecasted.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Paint: Water emulsion-based traffic paint must be approved by Owner
  1. Dunn Edwards: Vin-L-Stripe.
  2. Pervo Paint Company: Acrylic Traffic Paint.
  3. Sherwin Williams: Setfast Acrylic Traffic Paint.
  4. Vista Paint Corporation: Traffic Paint.
  5. Equal.

PART 3 - EXECUTION

3.01 PAVEMENT MARKINGS

- A. Application of Paint:
  1. Prior to application of paint, allow the pavement to properly cure. Clean and prepare in accordance with paint manufacturer's written recommendations.

2. Provide mechanical equipment to apply paint in a uniform, straight or curved pattern, without gaps, holidays, runs, or other defects.
3. Do not permit traffic until paint has completely cured.
4. Apply two coats in thickness recommended by manufacturer.
5. Playground Markings: Submit Samples to Owner for review. Limited color palettes may be submitted.

B. Marking Width and Color: Unless indicated otherwise, marking width and color are as follows:

<u>Location</u>	<u>Width</u>	<u>Color</u>
Parking stall lines	4 inches	White
Traffic markings		
Striping:	4 inches	Yellow
General	4 inches	Yellow
Accessible Parking	4 inches	Blue
International Symbol of Accessibility (ISA)	2 inches	White on blue background
Athletic Court Lines:	2 inches	*White
Letters and numbers:		As indicated

\*Where two sets of lines overlap, one set shall be white and the other set shall be yellow.

3.02 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.03 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Chain link fences and gates as indicated.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 05 5000 - Metal Fabrications.
3. Section 31 2200 - Grading.
4. Section 31 2316 - Excavation and Fill for Paving.
5. Section 32 0117 - Pavement Repair.
6. Section 32 1313 - Site Concrete Work.

1.02 SUBMITTALS

A. Shop Drawings:

1. Submit plans and details indicating extent of fences, locations of gates, and details of attachment and footings. Indicate means and methods for surface preparation and finishing.

1.03 QUALITY ASSURANCE

- A. Chain Link Fence Manufacturers Institute: CLFMI Product Manual.
- B. ASTM A123: Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A392: Specification for Zinc-Coated Steel Chain Link Fence Fabric. ASTM F567: Practice for Installation of Chain Link Fence.
- E. ASTM F626: Specification for Fence Fittings.
- F. ASTM F668: Specification for Poly (Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric.
- G. ASTM F900: Specification for Industrial and Commercial Swing Gates.
- H. ASTM F1083: Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
- I. ASTM F1184: Specification for Industrial and Commercial Horizontal Slide Gates.
- J. ASTM F1553: Guide for Specifying Chain Link Fence.



PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Materials and Properties: Comply with requirements of Section 03 3000 - Cast-in-Place Concrete to provide normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3,000 psi, 4-inch slump, and one inch maximum size aggregate.

1. Concrete may be provided in the following volumetric proportions:

Portland Cement	1 part
Fine Aggregate	2 parts
Coarse Aggregate (1/4 inch to 1-1/2 inches)	4 parts
Water	7 ½ gallons, maximum per sack of cement

B. Chain Link Fence Fabric: Conforming to ASTM A 392, Class C2 zinc coating, 2.00 ounces minimum per square foot of uncoated wire surface, hot-dipped galvanized after weaving, and top and bottom edges knuckled.

1. Fabric for perimeter fencing and interior fencing shall be 9 gage woven wire with 2 inch mesh, unless otherwise specified. It shall have at least 85% opening.
2. Fences 12 feet high or less shall be furnished with single width fabric.
3. Fabric for fencing on top of handball court shall be 9 gage wire minimum with 1 inch mesh.
4. Installed fence fabric shall be free from barbs, icicles, or other projections and installed fence fabric with such defects will be deemed defective Work.

C. Posts, Top Rails, Brace Rails and Gate Frames: Standard weight, galvanized, welded or seamless steel pipe conforming to ASTM F 1083, with a minimum yield strength of 35,000 psi. Embed posts into footing 6 inches less than the depth of the footing unless noted otherwise on drawings.

- F. Eye Tops: Malleable iron, ASTM F 626, , designed to fit over line posts, and for through passage of top rail.
- G. Expansion Sleeve Couplings for Top Rails: Steel, 6 inches long, designed to fit tightly on inside of rail, fitted with raised center.
- H. Rail Ends for Top Rails and Brace Rails: Malleable iron, ASTM F 626, with holes to receive 3/8 inch bolts for securing to rail end bands.
- I. Tension Bands and Bands for Securing Rail Ends: Mild steel flats, at least 11 gage x one inch, tension bands in gates shall be 11 gage by 1 inch. Bolts for use with tension bands and rail end bands shall be 3/8 inch by 1 ½-inch.
- J. Tension Bars: Mild steel flats at least 3/16 inch by 3/4 inch.
- K. Tension Wire for Installation at Bottom of Fabric: 6 gage steel spring wire, conforming to requirements of AISI Steel Products Manual, Carbon Steel Wire, Section 16, merchant quality, galvanized, soft temper with Type I coating. Wavy type wire is not acceptable.
- L. Turnbuckles for installation with Tension Wires: Eye and hook type, drop forged steel, right and left hand threads, at least 3/8 inch screw diameter with at least 4 ½-inches of take-up.
- M. Tie Wire: Aluminum ties 6 gage for fastening fabric to posts, top rails and brace rails. At bottom tension wire 9 gage galvanized hog rings shall be installed.
- N. Finish of Metal Parts: Post caps, couplings, rail ends, tension bands, tension bars, turnbuckles, rivets, bolts, and other metal parts and fittings shall be hot-dipped galvanized after fabrication, except bolts, which may be galvanized or cadmium-plated. Galvanizing shall conform to ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, and ASTM F 626 Specification for Fence Fittings.
- O. Paints for Refurbishing Existing Fence Posts, Rails, and Accessories: As required to provide the galvanized color of a new installation.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install fences to heights indicated on Drawings.
- B. Space fence posts at equal intervals between terminal, angle, corner, and gate posts, and not more than 10 feet apart measured from center to center of posts. In curved fence sections having a radius of 50 feet or less, space posts not more than 5 feet - 6 inches apart. Install posts so that top of eye of post caps are level with top of fabric.
- C. Install angle or corner posts at each change in direction of 15 degrees or more, at change of 5 percent or more in grade of fencing, and at the beginning and end of curved fence sections.

- D. Install terminal posts at ends of runs of fencing. Install gateposts on both sides of driveway and pedestrian gates. For double-leaf gates, net opening between gate posts shall be gate size as indicated on Drawings, plus 3 ½-inches; for single leaf gates, net opening shall be gate size plus 2 ½-inches.
- E. Where a fence is to be installed on a curb, construct footings with top of footing level with the lower finish grade. Align posts, set plumb and true before placing footings. Remove splattered concrete from exposed pipe surfaces while concrete is still soft. In bituminous surfaced areas, install seal coat on top of concrete footings.
- F. Install fences with top rail. Top rail shall pass through eye tops and be secured at ends with rail-end fittings and bands.
- G. Not used.
- H. Not used.
  
- I. Provide a transom rail and fabric at top of pedestrian gate openings. Install transom rail 6 feet 8 inches above high point of grade at gate opening. Ends of transom rails shall be pinned or riveted to rail end fittings with 1/4 inch mild steel rivets. Pin or rivet must go through rail and peen. Welding on rail ends is not permitted.
- J. Install bottom tension wire a minimum of 3 inches from grade for fencing, and provide a turnbuckle for each 150 feet of wire or fractional part thereof. Turnbuckles are not required in runs of 15 feet or less. Install ends of tension wires to posts in a manner to prevent slipping or loss of tension. Wrap should start from fence side of post. Turn end of wire around post tightly twisted at least three times around wire. At turnbuckles, wire through eye and tightly twist end at least three times around wire. Cut tail of bottom wire flush.
- K. Install fence fabric on outward facing side of posts, except for tennis courts. Install fence fabric with top edge projecting above top rail of fence.
- L. Install bottom of fence fabric to clear finish grades, except on bituminous surface install 3/4 inch above such surface. Locally shape and trench ground surfaces where necessary to provide uniform top and bottom alignment of fence.
- M. Tightly stretch fabric and at terminal, pull corner, angle, and gateposts, secure with tension bars extending full height of fence. Secure tension bars to posts with bolted tension bands spaced not more than 14 inches apart.
- N. Bands and Ties: Install bands and ties in accordance with following schedule:

7 bands on 8 feet fence	7 ties on 8 feet fence
6 bands on 6 feet fence	6 ties on 6 feet fence
4 bands on 4 feet fence	4 ties on 4 feet fence

- O. Fasten fabric to line posts with wire ties spaced not more than 16 inches apart. Where 6 gage aluminum ties are furnished, hook the tie at both ends. Installation of hooked ties with links is not permitted.
- P. Fasten fabric to top rails, mid-rails, brace rails, with wire ties spaced not more than 18 inches apart. Bend back ends of tie wires so as not to be a hazard. At bottom tension wire, install hog rings spaced not more than 18 inches apart. Where 2 fabrics are furnished, lap the fabrics one mesh at mid-rail and tie both fabrics with 9 gage wire or 6 gage aluminum ties to midrails.
- Q. Grind all field welds smooth, clean off flux and spatter, damaged galvanizing removed, burrs and projections ground off, properly prepared, then heavily coated with galvanizing repair coating of product approved by Owner’s Office of Environmental Health and Safety. Install coating in accordance with written recommendations of manufacturer.
- R. Fabrication of Gates:
  - 1. Frames: Fabricate gate frames from steel pipe of size specified, with joints at corners miter cut and continuously welded to sides.
  - 2. Fabric: Install fence fabric to side members with tension bars and tension bands as specified, spaced not more than 14 inches apart. Tension bars shall extend full height of gate. Install fence fabric to top and bottom members and to brace rail with wire ties as specified for top rails, spaced not more than 12 inches apart.
  - 3. Latches: Gate latches and strikes will be furnished by the Owner. Weld gate latches and strikes to gate posts and frames. Welding shall be performed before gate frames are galvanized, or welds shall be finished as specified for field welds.
  - 4. Hinges: Install and adjust hinges; burr or center punch threads of gate hinge bolts to prevent removal of nuts. Install 3 hinges on each post for swing gates more than 16 feet wide. Hinges will be provided by the Owner.
  - 5. Grind welds flush and smooth. Hot-dip galvanize fabricated parts after welding, or finish weld as specified for field welds.

3.02 REINSTALLED FENCING

- A. Not used.
  
  
  
  
  
  
  
  
  
  
- B. Not used.

3.03 FENCING ADJUSTMENTS

- A. Where the finish grade is raised 6 inches or less, cut and re-knuckle the existing fence fabric. Adjust tension wire and tie to fabric. Bottom of fence fabric shall be installed ¾" above finish grade.
- B. Where the finish pavement is lowered 6 inches or less, demolish the fence footing flush with the finish grade and adjust the fabric and its attachments. Bottom of fence fabric shall be installed ¾ inches above finish grade.
- C. Post footings and fabrics that require readjustment after installation shall be entirely replaced.

### 3.04 INSTALLATION OF GATES

- A. Provide gates of the sizes indicated on Drawings. Allow clearance on gates of 1-1/2 inches at bottom and one inch at top. Construct gates installed in sloping areas to conform to the grade. Provide an opening in each gate for access to locking device or padlock. Knuckle ends of fabric cut for opening to eliminate hazards.
- B. Sliding Gates and Swing Barricade Gates: Fabricate and install as indicated on Drawings. Wheel housing must be designed to fit tightly to roll track and prevent gate from rolling over objects. Unsupported cantilever type roll gates are not acceptable. Install gate stops in accordance with the drawings. Both top and track stops are required.

### 3.05 RE-FENCING

- A. Hardware Removal: Disassemble existing fence and all attachment hardware (bands, pipe, and wire) prior to preparation of posts for painting
- B. Fabric Removal: Do not remove more than what can be replaced during one day unless a barricade, providing equal security, will be installed in its place. If freestanding temporary fence is used, it must be clamped and wrap tied.
- C. Post and Rails: Bent posts, rails and accessories shall be replaced. Cut bent portion of posts and weld new sections of equal diameter and thickness. Install splice to inside of all welded section prior to welding. Previously repaired or welded posts shall be replaced as necessary.
- D. Painting:
  - 1. Preparation: Prepare exposed steel posts, rails and accessories thoroughly cleaned of rust, oil and foreign materials. Painted galvanized metal shall be stripped to bare metal before applying prime coat.
  - 2. Priming: Spot prime areas from which the original surface coating had been removed with a metal primer to match adjoining surfaces. Subsequently, install a prime coat to the entire surface to be painted.
  - 3. First Coat: Install first coat as recommended by the paint manufacturer. Furnish a color that is 10 percent to 15 percent lighter or darker than the finish coat.
  - 4. Second or Finish Coat: Install finish coat after the first coat has cured.
  - 5. Install paint in accordance with manufacturer's written recommendations.
  - 6. Protect adjacent structures, walls, concrete or asphalt from paint.

3.06 COMPLETION

- A. Completed fencing shall form continuous units between points indicated with required parts, accessories, and fittings provided and installed. Clean exposed metal surfaces of cement, grout and other foreign substances.
- B. Fill in holes left by removal of existing fence footings, except in areas where grading Work is indicated or specified, to existing grade with clean earth thoroughly compacted to at least same density as adjoining soil.

3.8 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

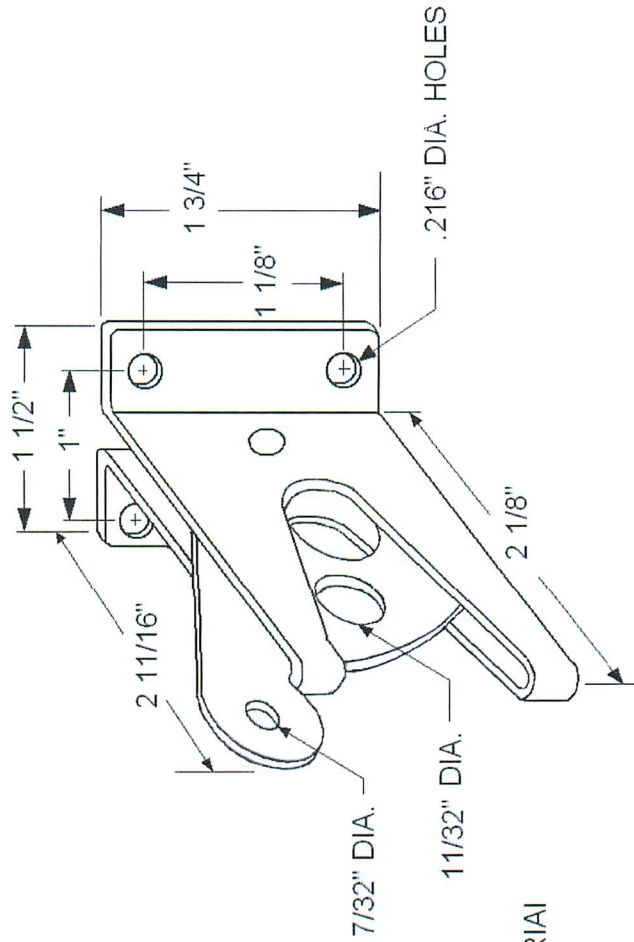
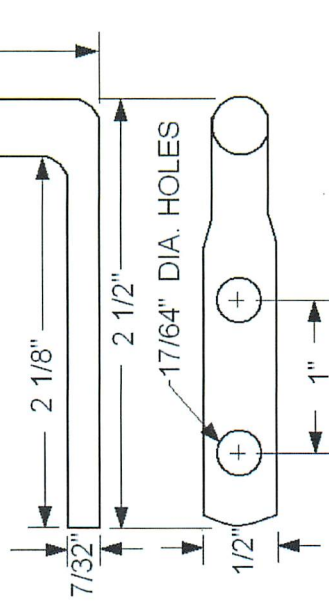
3.9 CLEANUP

- A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.


END OF SECTION

DIA. T-304 (18-8)  
S.S. BAR STOCK

GLSS-300 STRIKE



SATIN FINISH  
BODY & CATCH 12 GA. (.100") MATERIAL  
304 (18-8) STAINLESS STEEL

		MATERIAL:	FINISH:	DATE:	DWG BY:
JEFECO MFG INC FT. LAUDERDALE FL PH 954-527-4220 FAX 954-527-4229		STAINLESS STEEL	SATIN	4-7-16	SPK
REVISIONS:		MATERIAL ALLOY:	DESC:	NO.	
		304	GLSS 300 GATE LATCH	12294	
		TOLERANCES:	COMPANY:		
		+/- .015"	JEFECO MFG. INC.		

APPROVED BY:

## SECTION 328400-LANDSCAPE IRRIGATION

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. It is the intent of the specifications and drawings that the finished system is complete in every respect and shall be ready for operation satisfactory to the Owner.
- B. The work shall include all materials, labor, services, transportation, and equipment necessary to perform the work as indicated on the drawings, in these specifications, and as necessary to complete the contract.

## 1.02 CONSTRUCTION DRAWINGS

- A. Due to the scale of the drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.
- B. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications. When an item is shown on the plans but not shown on the specifications or vice versa, it shall be deemed to be as shown on both. The Landscape Architect shall have final authority for clarification.
- C. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Landscape Architect as soon as detected. In the event this notification is not performed, the Irrigation Contractor shall assume full responsibility for any revision necessary.

## 1.03 QUALITY ASSURANCE

- A. Provide at least one English speaking person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the manufacturer's recommended methods of installation and who shall direct all work performed under this section.
- B. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturer of articles used in this contract furnish directions covering points not shown in the drawings and specifications.



- C. All local, municipal, and state laws, rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.
- D. All materials supplied for this project shall be new and free from any defects. All defective materials shall be replaced immediately at no additional cost to Owner.
- E. The Contractor shall secure the required licenses and permits including payments of charges and fees, give required notices to public authorities, verify permits secured or arrangements made by others affecting the work of this section.

1.04 SUBMITTALS

A. Water Pressure Confirmation Letter:

- 1. After award of contract and before any irrigation system materials are ordered from suppliers or delivered to the job site, submit to the Owner a letter verifying that a dynamic water pressure test at the irrigation points of connection has been performed.
- 2. A dynamic water pressure test is performed to measure the water pressure at a point of connection with water in motion through the point of connection. Static water pressure testing, no water movement, shall not be acceptable.
- 3. The dynamic water pressure test shall be performed at the points of connection using the full flow volume (maximum demand) as indicated on the plans.
- 4. In the letter identify the water point of connections tested, the date of the test, time of the test, flow rate at which the test was performed and the measured dynamic water pressure in PSI.
- 5. If any discrepancies between the measured water pressure and the information shown on the plans are found, immediately notify the Landscape Architect and Irrigation Designer.
- 6. Failure to perform the dynamic water pressure test, or failure to report pressure discrepancies, shall place the full responsibility for all costs including revisions to the design, irrigation equipment re-sizing, and additional equipment quantities on the Irrigation Contractor.

B. Submittals Materials List:

- 1. After award of contract and before any irrigation system materials are ordered from suppliers or delivered to the job site, submit to the Owner a complete list of

all irrigation system materials, or processes proposed to be furnished and installed as part of this contract.

2. The submittals materials list shall include the following information:
  - a. A title sheet with the job name, the contractor’s name, contractor’s address and telephone number, submittal date and submittal number.
  - b. An index sheet showing the item number (i.e. 1,2,3, etc.); an item description (i.e. sprinkler head); the manufacturer’s name (i.e. Rain Bird); the item model number (i.e. 8005-SS); and the page(s) in the submittal set that contain the catalog cuts.
  - c. The catalog cuts shall be one or two pages copied from the most recent manufacturer’s catalog that indicate the product submitted. Do not submit parts lists, exploded diagrams, price lists or other extra information.
  - d. The catalog cuts shall clearly indicate the manufacturer’s name and the item model number. The item model number, all specified options and specified sizes shall be circled on the catalog cuts.
  - e. Submittals for equipment indicated on the legend without manufacturer names, or “as approved”, shall contain the manufacturer, Class or Schedule, ASTM numbers and/or other certifications as indicated in these specifications.

3. Submittal materials list format requirements:
  - a. Submittals shall be provided as one complete package for the project. Multiple partial submittals will not be reviewed.
  - b. Submittal package shall be stapled or bound in such a way as to allow for disassembly for review processing. Submittals shall not have tabs, tab sheets, spiral binding, or any other type of binding that will interfere with automated copying of submittals.
  - c. Submittal package shall have all pages numbered in the lower right hand corner. Page numbers shall correspond with submittal index.
  - d. Re-submitted packages must be revised to include only the equipment being re-submitted. Equipment previously reviewed and accepted shall not be re-submitted in the materials list/index sheet or in the catalog cut sheet package.

C. Substitutions: If the Irrigation Contractor wishes to substitute any equipment or materials for those equipment or materials listed on the irrigation drawings and specifications, he may do so by providing the following information to the Landscape Architect or Owner's authorized representative for approval.

1. Provide a written statement indicating the reason for making the substitution.
2. Provide catalog cut sheets, technical data, and performance information for each substitute item.
3. Provide in writing the difference in installed price if the item is accepted.

D. The Landscape Architect or Owner’s authorized representative will allow no substitutions without prior written acceptance.

- E. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.
- F. The Landscape Architect or Owner's authorized representative will not review the submittal package unless provided in the format described above.

#### 1.05 EXISTING CONDITIONS

- A. The Contractor shall verify and be familiar with the locations, size and detail of points of connection provided as the source of water and electrical supply to the irrigation system.
- B. Irrigation design is based on the available static water pressure shown on the drawings. Contractor shall verify static water on the project prior to the start of construction. Should a discrepancy exist, notify the Landscape Architect and Owner's authorized representative prior to beginning construction.
- C. Prior to cutting into the soil, the Contractor shall locate all cables, conduits, sewer septic tanks, and other utilities as are commonly encountered underground and he shall take proper precautions not to damage or disturb such improvements. If a conflict exists between such obstacles and the proposed work, the Contractor shall promptly notify the Landscape Architect and Owner who will arrange for relocations. The Contractor will proceed in the same manner if a rock layer or any other such conditions are encountered.
- D. The Contractor shall protect all existing utilities and features to remain on and adjacent to the project site during construction. Contractor shall repair, at his own cost; all damage resulting from his operations or negligence.
- E. The Irrigation Contractor shall coordinate with the General Contractor for installation of required sleeving as shown on the plans prior to paving operations.
- F. The Contractor shall verify and be familiar with the existing irrigation systems in areas adjacent to and within the Project area of work.
- G. The Contractor shall protect all existing irrigation systems, in areas adjacent to and within the project area of work, from damage due to his operations.
- H. Contractor shall notify Owner's Representative if any existing system is temporarily shut off, capped or modified. Provide 48-hour notice, prior to turning off or modifying any existing irrigation system.
- I. The Contractor shall repair or replace all existing irrigation systems, in areas adjacent to and within the project area of work, damaged by the construction of this project. Adjacent irrigation systems shall be made completely operational and provide complete coverage of the existing landscaped areas. All repairs shall be complete to the satisfaction of the Owner's Representative.
- J. The contractor shall provide bore holes under any existing pavement or paving encountered for the required lateral, mainline and low voltage control wire sleeving. Bore holes under 2 inches in diameter and smaller shall be made with a BulletMole®

underground boring tool as manufactured by Dimension Tools, LLC (Contact telephone number (888)-650-5554 or at [www.bulletmole.com](http://www.bulletmole.com)). Bore holes larger than 2 inches in diameter shall be made with an approved mechanical boring tool. No air jacking or hydraulic boring of any kind shall be allowed.

## 1.06 INSPECTIONS

- A. The Contractor shall permit the Landscape Architect and Owner's authorized representative to visit and inspect at all times any part of the work and shall provide safe access for such visits.
- B. Where the specifications require work to be tested by the Contractor, it shall not be covered over until accepted by the Landscape Architect, Owner's authorized representative, and/or governing agencies. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing. Should any work be covered without testing or acceptance, it shall be, if so ordered, uncovered at the Contractor's expense.
- C. Inspections will be required for the following at a minimum:
  - 1. Pre-construction meeting.
  - 2. System layout.
  - 3. Pressure test of irrigation mainline (Four hours at 125 PSI or 120% of static water pressure, whichever is greater.) Mainline pressure loss during test shall not exceed 2 PSI.
  - 4. Coverage test of irrigation system. Test shall be performed prior to any planting.
  - 5. Final inspection prior to start of maintenance period.
  - 6. Final acceptance prior to turnover.
- D. Site observations and testing will not commence without the field record drawings as prepared by the Irrigation Contractor. Record drawings must be complete and up to date for each site visit.
- E. Work that fails testing and is not accepted will be retested. Hourly rates and expenses of the Landscape Architect, Owner's authorized representative, and governing agencies for re-inspection or retesting will be paid by the Irrigation Contractor at no additional expense to Owner.

## 1.07 STORAGE AND HANDLING

- A. Use all means necessary to protect irrigation system materials before, during, and after installation and to protect the installation work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the acceptance of the Landscape Architect and Owner and at no additional cost to the Owner.
- B. Exercise care in handling, loading, unloading, and storing plastic pipe and fittings under cover until ready to install. Transport plastic pipe only on a vehicle with a bed long enough to allow the pipe to lay flat to avoid undue bending and concentrated external load.

## 1.08 CLEANUP AND DISPOSAL

- A. Dispose of waste, trash, and debris in accordance with applicable laws and ordinances and as prescribed by authorities having jurisdiction. Bury no such waste material and debris on the site. Burning of trash and debris will not be permitted. The Contractor shall remove and dispose of rubbish and debris generated by his work and workmen at frequent intervals or when ordered to do so by the Owner's authorized representative.
- B. At the time of completion the entire site will be cleared of tools, equipment, rubbish and debris which shall be disposed of off-site in a legal disposal area.

## 1.09 TURNOVER ITEMS

- A. Record Drawings:
  - 1. Record accurately on one set of drawings all changes in the work constituting departures from the original contract drawings and the actual final installed locations of all required components as shown below.
  - 2. The record drawings shall be prepared to the satisfaction of the Owner. Prior to final inspection of work, submit record drawings to the Landscape Architect or Owner's authorized representative.
  - 3. All record drawings shall be prepared using AutoCAD 2014 drafting software and the original irrigation drawings as a base. No manual drafted record drawings shall be acceptable. The Contractor may obtain digital base files from the Landscape Architect or Owner's authorized representative.
  - 4. If the Contractor is unable to provide the AutoCAD drafting necessary for the record drawings the irrigation designer does provide record drawing drafting as a separate service.
  - 5. Prior to final inspection of work, submit record drawings plotted onto vellum sheets for review by the Landscape Architect or Owner's authorized

representative. After acceptance by the Landscape Architect, City Inspector or Owner’s authorized representative re-plot the record drawings onto reproducible Mylar sheets. The Contractor shall also provide record drawing information on a digital AutoCAD Release 2014 drawing file. All digital files shall be provided on a compact disc (CD) clearly marked with the project name, file descriptions and date.

- a. Record drawing information and dimensions shall be collected on a day-to-day basis during the installation of the pressure mainline to fully indicate all routing locations and pipe depths. Locations for all other irrigation equipment shall be collected prior to the final inspection of the work.
  - b. Two dimensions from two permanent points of reference such as buildings, sidewalks, curbs, streetlights, hydrants, etc. shall be shown for each piece of irrigation equipment shown below. Where multiple components are installed with no reasonable reference point between the components, dimensioning may be made to the irrigation equipment. All irrigation symbols shall be clearly shown matching the irrigation legend for the drawings. All lettering on the record drawings shall be minimum 1/8 inch in size.
6. Show locations and depths of the following items:
- a. Point of connection (including water POC, master control valves, flow sensors, etc.)
  - b. Routing of pressure main lines (dimensions shown at a maximum of 100 feet along routing)
  - c. Isolation valves
  - d. Automatic remote control valves (indicate station number and size)
  - e. Quick coupling valves
  - f. Drip air relief and flush valves
  - g. Routing of control wires where separate from irrigation mainline
  - h. Irrigation controllers (indicate controller number and station count)
  - i. Related equipment (as may be directed)

B. Controller Charts:

- 1. Provide one controller chart for each automatic controller. Chart shall show the area covered by the particular controller. The areas covered by the individual control valves shall be indicated using colored highlighter pens. A minimum of six individual colors shall be used for the controller chart unless less than six control valves are indicated.
- 2. Landscape Architect or Owner's authorized representative must approve record drawings before controller charts are prepared.
- 3. The chart is to be a reduced copy of the actual "record" drawing. In the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a readable size.
- 4. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils in thickness.

C. Operation and Maintenance Manuals:

1. Two individually bound copies of operation and maintenance manuals shall be delivered to the Landscape Architect or Owner's authorized representative at least 10 calendar days prior to final inspection. The manuals shall describe the material installed and the proper operation of the system.
2. Each complete, bound manual shall include the following information:
3. Index sheet stating Contractor's address and telephone number, duration of guarantee period, list of equipment including names and addresses of local manufacturer representatives.
  - a. Operating and maintenance instructions for all equipment.
  - b. Spare parts lists and related manufacturer information for all equipment.

D. Equipment:

1. Supply as a part of this contract the following items:
  - a. One (1) wrench for disassembly and adjustment of each type of sprinkler head used in the irrigation system.
  - b. Two (2) 30-inch sprinkler keys for manual operation of control valves.
  - c. Two (2) keys for each automatic controller.
  - d. Two (2) quick coupler keys with a 1" bronze hose bib, bent nose type with hand wheel and two coupler lid keys.
  - e. One (1) valve box cover key or wrench.
  - f. Three (3) extra sprinkler heads of each size and type.
  - g. One hundred (100) feet of inline drip tubing of the size and type.
  - h. Twenty (20) each of 3lbows, tees and coupling 17mm barbed tubing fittings.
2. The above equipment shall be turned over to Owner's authorized representative at the final inspection.

1.10 COMPLETION

- A. At the time of the pre-maintenance period inspection, the Landscape Architect, Owner's authorized representative, and governing agencies will inspect the work, and if not accepted, will prepare a list of items to be completed by the Contractor. Punch list to be checked off by contractor and submitted to Landscape Architect or Owner's authorized representative prior to any follow-up meeting. This checked off list to indicate that all punch list items have been completed. At the time of the post-maintenance period or final inspection the work will be re-inspected and final acceptance will be in writing by the Landscape Architect, Owner's authorized representative, and governing agencies.
- B. The Owner's authorized representative shall have final authority on all portions of the work.

- C. After the system has been completed, the Contractor shall instruct Owner's authorized representative in the operation and maintenance of the irrigation system and shall furnish a complete set of operating and maintenance instructions.
- D. Any settling of trenches which may occur during the one-year period following acceptance shall be repaired to the Owner's satisfaction by the Contractor without any additional expense to the Owner. Repairs shall include the complete restoration of all damage to planting, paving or other improvements of any kind as a result of the work.

1.11 GUARANTEE

- A. The entire sprinkler system, including all work done under this contract, shall be unconditionally guaranteed against all defects and fault of material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the filing of the Notice of Completion.
- B. Should any problem with the irrigation system be discovered within the guarantee period, it shall be corrected by the Contractor at no additional expense to Owner within ten (10) calendar days of receipt of written notice from Owner. When the nature of the repairs as determined by the Owner constitute an emergency (i.e. broken pressure line) the Owner may proceed to make repairs at the Contractor's expense. Any and all damages to existing improvement resulting either from faulty materials or workmanship, or from the necessary repairs to correct same, shall be repaired to the satisfaction of the Owner by the Contractor, all at no additional cost to the Owner.
- C. Guarantee shall be submitted on Contractors own letterhead as follows:

SCHEDULE 1 - GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

SCHEDULE 2 - We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defective material during the period of one year from date of filing of the Notice of Completion and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 calendar days following written notification by the Owner. In the event of our failure to make such repairs or replacements within the time specified after receipt of written notice from Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

SCHEDULE 3 - PROJECT NAME:

SCHEDULE 4 - PROJECT LOCATION:



SCHEDULE 5 - CONTRACTOR NAME:

SCHEDULE 6 - ADDRESS:

SCHEDULE 7 - TELEPHONE:

SCHEDULE 8 - SIGNED:

SCHEDULE 9 - DATE:

PART 2 - MATERIALS

2.01 SUMMARY

- A. Use only new materials of the manufacturer, size and type shown on the drawings and specifications. Materials or equipment installed or furnished that do not meet Landscape Architect's, Owner's, or governing agencies standards will be rejected and shall be removed from the site at no expense to the Owner.

2.02 PIPE

- A. Pressure supply lines 1 1/2 inches in diameter and smaller, as used in control valve assemblies only, shall be Schedule 40 solvent weld PVC conforming to ASTM D1785.
- B. Pressure supply lines 2 inches in diameter and larger, as used in control valve assemblies and between the master control valve and flow sensor only, shall be Class 315 solvent weld PVC. Piping shall conform to ASTM D2241.
- C. Non-pressure lines 3/4 inch in diameter and larger downstream of the remote control valve shall be SCH 40 solvent weld PVC conforming to ASTM D1785.
- D. All piping used for recycled water systems shall be color coded purple and be marked with recycled water warnings as required by the purveyor of the recycled water.

2.03 PLASTIC PIPE AND FITTINGS

- A. Pipe shall be marked continuously with manufacturer's name, nominal pipe size, schedule or class, PVC type and grade, National Sanitation Foundation approval, Commercial Standards designation, and date of extrusion.

- B. All plastic pipe shall be extruded of an improved PVC virgin pipe compound in accordance with ASTM D2672, ASTM D2241 or ASTM D1785.
- C. All solvent weld PVC fittings shall be standard weight Schedule 40 (and Schedule 80 where specified on the irrigation detail sheet, all mainline fittings shall be Schedule 80 PVC) and shall be injection molded of an improved virgin PVC fitting compound. Slip PVC fittings shall be the "deep socket" bracketed type. Threaded plastic fittings shall be injection molded. All tees and ells shall be side gated. All fittings shall conform to ASTM D2464 and ASTM D2466.
- D. All threaded nipples shall be standard weight Schedule 80 with molded threads and shall conform to ASTM D1785.
- E. All solvent cementing of plastic pipe and fittings shall be a two-step process, using primer and solvent cement applied per the manufacturer's recommendations. Cement shall be of a fluid consistency, not gel-like or ropy. Solvent cementing shall be in conformance with ASTM D2564 and ASTM D2855.
- F. When connection is plastic to metal, female adapters shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be non-lead base Teflon paste, tape, or equal.
- G. All pressure mainlines, 2" size and larger, shall be installed with concrete thrust blocking at all directional changes in the mainline routing.

2.04 VALVES

- A. Ball Valves:
  - 1. Ball valves shall be of the manufacturer, size, and type indicated on the drawings.
  - 2. Ball valves for mainline isolation shall be slow closing type, no "quarter turn" ball valves shall be acceptable.
  - 3. Ball valves for mainline isolation shall be constructed of a Sch. 80 PVC body, ball and stem. Ball valves shall have union connections with solvent weld socket adapters.
  - 4. Ball valves for drip system flush valves shall be constructed of a Sch. 40 PVC body, ball and stem. Ball valves shall have solvent weld socket connections.
  - 5. All ball valves shall have a minimum working pressure of not less than 150 PSI and shall conform to AWWA standards.
- B. Quick Coupler Valves:
  - 1. Quick coupler valves shall be of the manufacturer, size, and type indicated on the drawings.

2. Quick coupler valves shall be brass with a wall thickness guaranteed to withstand normal working pressure of 150 psi without leakage. Valves shall have 1" female threads opening at base, with two-piece body. Valves to be operated only with a coupler key, designed for that purpose. Coupler key is inserted into valve and a positive, watertight connection shall be made between the coupler key and valve.
3. Quick coupling valve used with recycled water systems shall be specifically designed for use with non-potable water and have purple colored vinyl covers.

C. Automatic Control Valves:

1. Automatic control valves shall be of the manufacturer, size, and type indicated on the drawings.
2. Automatic control valves include master valves, remote control valves and drip remote control valves.
3. Automatic control valves shall have brass or bronze bodies, brass or plastic bonnets, brass or stainless steel stems.
4. Automatic control valves shall be electrically operated.
5. Provide Christy's valve ID tags for each remote control valve with valve number.

D. Flow Sensors:

1. Flow sensors shall be of the manufacturer, size, and type indicated on the drawings.
2. Flow sensors shall be PVC TEE types with nylon impellers and epoxy encapsulated electronics.

E. Mainline Basket Strainers:

1. Mainline basket strainers shall be of the manufacturer, size, and type indicated on the drawings.
2. Mainline basket strainers shall be part of the specified point of connection assembly and include all related equipment as specified.

2.05 VALVE BOXES

- A. Valve boxes shall be of the manufacturer, size, and type indicated on the drawings.
- B. Valve boxes shall be fabricated from a durable, weather-resistant plastic material resistant to sunlight and chemical action of soils.
- C. The valve box cover shall be and secured with a hidden latch mechanism or bolts.

- D. Valve box lids shall be black in color. All valve boxes for recycled water equipment shall have purple color coded identification tags installed onto the lid.
- E. The cover and box shall be capable of sustaining a load of 1,500 pounds.
- F. Valve box extensions shall be by the same manufacturer as the valve box.
- G. The plastic irrigation valve box cover shall be an overlapping type.
- H. Automatic control valve, master valve, flow sensor, pull boxes, and controller ground rod boxes shall be “standard” rectangular size. Valve box covers shall be marked "RCV" with the valve identification number, or “MV”, “FS”, “PB” or “GRND” "heat branded" onto the cover in 1 inch high letters / numbers.
- I. Drip automatic control valve, master valve boxes shall be “jumbo” rectangular size. Valve box covers shall be marked "RCV" with the valve identification number "heat branded" onto the cover in 1 inch high letters / numbers
- J. Drip air relief valve boxes shall be 7" circular size. Valve box covers shall be marked with “ARV” "heat branded" onto the cover in 1 inch high letters.
- K. Ball valve and quick coupler valve boxes shall be 10" circular size. Valve box covers shall be marked with “BV” or "QCV" "heat branded" onto the cover in 1 inch high letters.

## 2.06 AUTOMATIC CONTROLLER

- A. Automatic controller shall be of the manufacturer, size, and type indicated on the drawings.
- B. Automatic controller shall be a satellite controller with all required equipment to provide flow sensing and automatic program adjustment in response to daily evapotranspiration data.
- C. Automatic controller shall be a pre-assembled unit and equipped with all components indicated on the plans.
- D. Controller enclosure shall be of the manufacturer, size, and type indicated on the drawings.
- E. Controller shall be grounded according to local codes using equipment of the manufacturer, size, and type indicated on the drawings; or as required by local codes and ordinances.

## 2.07 ELECTRICAL

- A. All electrical equipment shall be NEMA Type 3, waterproofed for exterior installations.

- B. All electrical work shall conform to local codes and ordinances.

2.08 LOW VOLTAGE CONTROL WIRING

- A. Remote control wire shall be direct-burial AWG-UF type, size as indicated on the drawings, and in no case smaller than 14 gauge.
- B. Connections shall of the manufacturer, size, and type indicated on the drawings.
- C. Common wires shall be white in color. Control wires shall be red (where two or more controllers are used, the control wires shall be a different color for each controller. These colors shall be noted on the "Record Drawings" plans located on controller door).
- D. Ground wires shall be green in color or bare copper and in no case smaller than 6 gauge.

2.09 IRRIGATION HEADS AND INLINE DRIP TUBING

- A. Irrigation heads and inline drip tubing shall be of the manufacturer, size, type, with radius of throw, operating pressure, and discharge rate indicated on the drawings.
- B. Irrigation heads inline drip tubing shall be used as indicated on the drawings.

2.10 DRIP IRRIGATION EQUIPMENT

- A. Drip tubing equipment such as flush valve / indicator heads, air relief valves, wye strainers and pressure regulators shall be of the manufacturer, size, and type indicated on the drawings.
- B. All drip irrigation equipment used with recycled water shall have a purple colored, recycled water warning tag affixed to the valve to identify it as being connected to a recycled water source.

2.11 MISCELLANEOUS EQUIPMENT

- A. Landscape Fabric:
  - 1. Landscape fabric for valve box assemblies shall be 5.0- oz. weight woven polypropylene weed barrier. Landscape fabric shall have a burst strength of 225 PSI, a puncture strength of 60 lbs. and capable of water flow of 12 gallons per minute per square foot.
  - 2. Type: DeWitt Pro 5 Weed Barrier or approved equal.
- B. Recycled Water Warning Signs:

1. Recycled water warning signs shall be of the size and type indicated on the drawings.
2. Recycled water warning signs shall be as approved by the local water district.

### PART 3 - EXECUTION

#### 3.01 SITE CONDITIONS

##### A. Inspections:

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer's recommendations.

##### B. Discrepancies:

1. In the event of discrepancy, immediately notify the Landscape Architect or Owner's authorized representative.
2. Do not proceed with installation in areas of discrepancy until all discrepancies have been resolved.

##### C. Grades:

1. Before starting work, carefully check all grades to determine that work may safely proceed, keeping within the specified material depths with respect to finish grade.
2. Final grades shall be accepted by the Engineer before work on this section will be allowed to begin.

##### D. Field Measurements:

1. Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design. Contractor shall coordinate the installation of all irrigation materials with all other work.
2. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions prior to proceeding with work under this section.
3. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities, which are caused by his operations or neglect.

E. Diagrammatic Intent:

3.02 THE DRAWINGS ARE ESSENTIALLY DIAGRAMMATIC. THE SIZE AND LOCATION OF EQUIPMENT AND FIXTURES ARE DRAWN TO SCALE WHERE POSSIBLE. PROVIDE OFFSETS IN PIPING AND CHANGES IN EQUIPMENT LOCATIONS AS NECESSARY TO CONFORM TO STRUCTURES AND TO AVOID OBSTRUCTIONS OR CONFLICTS WITH OTHER WORK AT NO ADDITIONAL EXPENSE TO OWNER.

A. Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads, valves, and automatic controller.
2. Layout irrigation system and make minor adjustments required due to differences between site and drawings. Where piping is shown on drawings under paved areas, but running parallel and adjacent to planted areas, install the piping in the planted areas.

B. Water Supply:

3.03 CONNECTIONS TO, OR THE INSTALLATION OF, THE WATER SUPPLY SHALL BE AT THE LOCATIONS SHOWN ON THE DRAWINGS. MINOR CHANGES CAUSED BY ACTUAL SITE CONDITIONS SHALL BE MADE AT NO ADDITIONAL EXPENSE TO OWNER.

A. Electrical Service:

1. Connections to the electrical supply shall be at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made at no additional expense to Owner.
2. Contractor shall make electrical connections to the irrigation controller. Electrical power source to controller locations shall be provided by others.
3. Contractor shall make electrical connections to the irrigation controller. 230-volt single-phase electrical power source to pump assembly location shall be provided by others per NEC codes.

3.04 TRENCHING

- A. Excavations shall be straight with vertical sides, even grade, and support pipe continuously on bottom of trench. Trenching excavation shall follow layout indicated on drawings to the depths below finished grade and as noted. Where lines occur under paved area, these dimensions shall be considered below subgrade.

- B. Provide minimum cover of 18 inches on pressure supply lines.
- C. Provide minimum cover of 18 inches for control wires.
- D. Provide minimum cover of 24 inches for sleeves below non-vehicular paving.
- E. Provide minimum cover of 36 inches on pressure supply lines under vehicular travel ways.
- F. Provide minimum cover of 12 inches for non-pressure lines.
- G. Pipes installed in a common trench shall have a 4-inch minimum space between pipes.

### 3.05 BACKFILLING

- A. Backfill material on all lines shall be the same as adjacent soil free of debris, litter, and rocks over 1/2 inches in diameter.
- B. Backfill shall be tamped in 4-inch layers under the pipe and uniformly on both sides for the full width of the trench and the full length of the pipe. Backfill materials shall be sufficiently damp to permit thorough compaction, free of voids. Backfill shall be compacted to dry density equal to adjacent undisturbed soil and shall conform to adjacent grades.
- C. Flooding in lieu of tamping is not allowed.
- D. Under no circumstances shall truck wheels be used to compact backfill.
- E. Provide sand backfill a minimum of 4 inches over and under all piping under paved areas.

### 3.06 PIPING

- A. Piping under existing pavement may be installed by jacking, boring, or hydraulic driving. No hydraulic driving is permitted under asphalt pavement.
- B. Cutting or breaking of existing pavement is not permitted.
- C. Carefully inspect all pipe and fittings before installation, removing dirt, scale, burrs, and reaming. Install pipe with all markings up for visual inspection and verification.
- D. Remove all dented and damaged pipe sections.
- E. All lines shall have a minimum clearance of 4 inches from each other and 12 inches from lines of other trades.
- F. Parallel lines shall not be installed directly over each other.



- G. In solvent welding, use only the specified primer and solvent cement and make all joints in strict accordance with the manufacturer's recommended methods including wiping all excess solvent from each weld. Allow solvent welds at least 15 minutes setup time before moving or handling and 24 hours curing time before filling.
- H. PVC pipe shall be installed in a manner, which will provide for expansion and contraction as recommended by the pipe manufacturer.
- I. Center load all plastic pipe prior to pressure testing.
- J. All threaded plastic-to-plastic connections shall be assembled using Teflon tape or Teflon paste.
- K. For plastic-to-metal connections, work the metal connections first. Use a non-hardening pipe dope on all threaded plastic-to-metal connections, except where noted otherwise. All plastic-to-metal connections shall be made with plastic female adapters.

### 3.07 CONTROLLER

- A. The exact location of the controller shall be approved by the Landscape Architect or Owner's authorized representative before installation. The electrical service shall be coordinated with this location.
- B. The Irrigation Contractor shall be responsible for the final electrical hook up to the irrigation controller.
- C. The irrigation system shall be programmed to operate during the periods of minimal use of the design area.
- D. The irrigation controller shall be registered with the manufacturer and the evapotranspiration download service be activated. The controller to be fully programmed for automatic adjustment. Provide all access codes and passwords for the controller manufacturer's website to the Owner. Provide proof of registration, activation and programming to the Owner.

### 3.08 CONTROL WIRING

- A. Low voltage control wiring shall occupy the same trench and shall be installed along the same route as the pressure supply lines whenever possible.
- B. Where more than one wire is placed in a trench, the wiring shall be taped together in a bundle at intervals of 10 feet. Bundle shall be secured to the mainline with tape at intervals of 20 feet.
- C. All connections shall be of an approved type and shall occur in a valve box. Provide an 18-inch service loop at each connection.

- D. An expansion loop of 12 inches shall be provided at each wire connection and/or directional change, and one of 24 inches shall be provided at each remote control valve.
- E. A continuous run of wire shall be used between a controller and each remote control valve. Under no circumstances shall splices be used without prior approval.

### 3.09 VALVES

- A. Basket strainers, master valves, flow sensors, automatic control valves, drip automatic control valves, quick coupler, ball valves, and drip system air relief valves are to be installed in the approximate locations indicated on the drawings.
- B. Valve shall be installed in shrub, mulch or dirt areas.
- C. Install all valves as indicated in the detail drawings.
- D. Valves to be installed in valve boxes shall be installed one valve per box.
- E. Provide valve ID tags for each remote control valve with valve number.
- F. Provide recycled water warning tags on each valve installed.

### 3.10 VALVE BOXES

- A. Valve boxes shall be installed in shrub areas whenever possible.
- B. Each valve box shall be installed on a foundation of 3/4 inch gravel backfill, to a minimum depth of 4 inches in the bottom of the valve box. Valve boxes shall be installed with their tops 1/2 inch above the surface of surrounding finish grade in lawn areas and 2 inches above finish grade in ground cover areas.

### 3.11 IRRIGATION HEADS AND INLINE DRIP TUBING

- A. Irrigation heads and inline drip tubing shall be installed as indicated on the drawings.
- B. Spacing of heads and inline drip tubing shall not exceed maximum indicated on the drawings.
- C. Riser nipples shall be of the same size as the riser opening in the sprinkler body.

### 3.12 MISCELLANEOUS EQUIPMENT

- A. Install all assemblies specified herein according to the respective detail drawings or specifications, using best standard practices.

- B. Install devices such as flush valves, and air relief valves as indicated on the drawings and as recommended by the manufacturer.
- C. Install recycled water warning signs as indicated on the drawings and as required by the local water district.

### 3.13 FLUSHING THE SYSTEM

- A. Prior to installation of irrigation heads, the valves shall be opened and a full head of water used to flush out the lines and risers.
- B. Irrigation heads shall be installed after flushing the system has been completed.

### 3.14 ADJUSTING THE SYSTEM

- A. Contractor shall adjust valves, align heads, and check the coverage of each system prior to coverage test.
- B. If it is determined by the Landscape Architect or Owner's authorized representative that additional adjustments or nozzle changes will be required to provide proper coverage, all necessary changes or adjustments shall be made prior to any planting.
- C. The entire system shall be operating properly before any planting operations commence.
- D. Automatic control valves are to be adjusted so that the irrigation heads, drip emitters and inline drip tubing operate at the pressure recommended by the manufacturer.

### 3.15 TESTING AND OBSERVATION

- A. Do not allow or cause any of the work of this section to be covered up or enclosed until it has been observed, tested and accepted by the Landscape Architect, Owner, and governing agencies.
- B. The Contractor shall be solely responsible for notifying the Landscape Architect, Owner, and governing agencies, a minimum of 48 hours in advance, where and when the work is ready for testing.
- C. When the sprinkler system is completed, the Contractor shall perform a coverage test of each system in its entirety to determine if the water coverage for the planted areas is complete and adequate in the presence of the Landscape Architect.
- D. The Contractor shall furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the plans, or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate, without bringing this to the attention of the Landscape Architect. This test shall be accepted by the Landscape Architect and accomplished before starting any planting.

- E. Areas to be maintained for the formal maintenance period shall start maintenance at the same time, as directed by the Landscape Architect, Owner, and governing agencies. Partial areas will not be released into maintenance prior to completion of items listed in the pre-maintenance review. The maintenance period may not be phased.
- F. If, after the maintenance review, the irrigation systems are not accepted by the Landscape Architect, the contractor shall reimburse the Architect for additional site visits, or additional time required to review work. All additional time will be billed at the Architect's hourly rate and will be paid for by the contractor at no additional cost to the owner.
- G. Final inspection will not commence without record drawings as prepared by the Irrigation Contractor.

### 3.16 MAINTENANCE

- A. During the maintenance period the Contractor shall adjust and maintain the irrigation system in a fully operational condition providing complete irrigation coverage to all intended plantings.

### 3.17 COMPLETION CLEANING

- A. Clean up shall be made as each portion of the work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be swept, and any damage sustained on the work of others shall be repaired to original conditions.

END OF SECTION

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SECTION 32 91 13- SOIL PREPARATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes planting soils specified by composition of the mixes.

1.02 DEFINITIONS

- A. Imported Soil: Soil that is transported to Project site for use.
- B. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each bulk-supplied material in sealed containers labeled with content, source, and date obtained; providing an accurate representation of composition, color, and texture.

1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
- B. Soil Analysis: If the contract documents do not include an agricultural suitability report, Contractor shall, after rough grading, provide for agricultural suitability testing and a written report by a qualified soil-testing laboratory. Recommendations of agricultural suitability and fertility analysis soils report, after review by agency and/or construction manager (CM), may take precedence over these specifications.
  - 1. The soil-testing laboratory shall oversee soil sampling. Quantity of test sites shall be determined by agency and/or project construction manager (CM).
    - 2. Report suitability of tested soil for plant growth.
      - a. Recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
      - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.
    - 3. Provide a soils analysis of each soil type.

PART 2 - PRODUCTS

2.01 PLANTING SOILS SPECIFIED BY COMPOSITION

A. Planting Soils: ASTM D 5268 topsoil topsoil or existing, native surface topsoil amended with inorganic and organic soil amendments and fertilizers in specified quantities shall consist of fertile, friable soil of loamy character, and shall contain an amount of organic matter normal to the area. It shall be reasonably free from weeds, refuse, roots, heavy or stiff clay, stones larger than one inch (1”) in diameter, sticks, brush, litter and other deleterious substances. Topsoil may be obtained from the site if approved by the District.

1. For bidding purposes, or in the event a Soils Analysis as described in Article 1.5 Paragraph B is not performed at time of bidding, the following amendments shall be uniformly cultivated into the upper eight inches (8”), per 1000 square feet, of soil by suitable equipment operated at approximate right angles in at least two (2) directions.

- a. Nitrogen stabilized organic amendment: 4 CY
- b. Gro Power Plus: 150 LBS
- c. Agricultural Gypsum: 100 LBS

B. Backfill for Plant Pits: Backfill shall be machine-mixed and approved by the Engineer prior to incorporation in planting pits. For bidding purposes, or in the event a Soils Analysis as described in Article 1.6 Paragraph B is not performed, the following amendments shall be provided

- 1. On-site Soil: 6 parts by volume
- 2. Nitrogen stabilized organic amendment 4 parts by volume
- 3. Gro Power Plus 17 pounds per CY of mix
- 4. Iron Sulfate 1 pounds per CY of mix
- 5. Agricultural Gypsum 10 pounds per CY of mix

2.02 INORGANIC SOIL AMENDMENTS

A. For bidding purposes, or in the event a Soils Analysis as described in Article 1.6 Paragraph B is not performed, the following inorganic amendments shall be provided.

- 1. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
  - a. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
  - b. Class: O, with a minimum of 95 percent passing through a No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
- 2. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- 3. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
  - 4. Perlite: Horticultural perlite, soil amendment grade.
- 5. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.

- 6. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

2.03 ORGANIC SOIL AMENDMENTS

- A. Nitrogen stabilized organic amendment shall be a ground or processed wood product derived from wood of redwood, fir or cedar, treated with a non-toxic agent to absorb water quickly. Nitrogen content, based on dry weight, shall be 0.5% for redwood and 0.7% for fir and cedar. Iron content, based on dry weight, shall be 0.1%.
- B. Wood derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil or toxic materials.

2.04 FERTILIZERS

- A. Fertilizers shall comply with applicable requirements of the State Agricultural Codes and shall be packaged, first grade, commercial quality products identified as to source, type of material, weight and manufacturer’s guaranteed analysis. Fertilizers shall not contain toxic ingredients in quantities harmful to human, animal, or plant life.
- B. Commercial fertilizer shall be pelleted or granular product having the chemical analysis specified herein and shall be free-flowing material delivered in original unopened containers. Use of material which becomes caked or otherwise damaged shall not be permitted.
- C. Organic base fertilizer shall be a highly concentrated humate material derived from decomposed animal, fish, and vegetable matter with humic acids and trace minerals.
- D. Iron sulfate shall be ferrous sulfate containing not less than twenty-one and one-half percent (21.5%) iron expressed as metallic iron.

PART 3 - EXECUTION

3.01 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

3.02 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- B. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.



- C. Screening: remove stones larger than 1 inch in diameter.

3.03 BLENDING PLANTING SOIL IN PLACE

- A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is muddy, or excessively wet.
- B. Preparation: Till unamended, existing soil in planting areas to a minimum depth eight inches (8"). Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off District's property.
- C. Mixing: Apply soil amendments and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.
  - 1. Mix lime and sulfur, if required, with dry soil before mixing fertilizer.
  - 2. Mix fertilizer with planting soil no more than seven days before planting.
- D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.04 FIELD QUALITY CONTROL

- A. Testing Agency: The District will engage a qualified testing agency to perform tests and inspections.
  - B. Perform the following tests:
    - 1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 1000 sq. ft. of in-place soil or part thereof.
    - C. Soil will be considered defective if it does not pass tests.
    - D. Prepare test reports.
  - E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.05 PROTECTION AND CLEANING

- A. Protection Zone: Identify protection zones according to Section 01 56 39 "Temporary Tree and Plant Protection."

- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
1. Storage of construction materials, debris, or excavated material.
  2. Parking vehicles or equipment.
  3. Vehicle traffic.
  4. Foot traffic.
  5. Erection of sheds or structures.
  6. Impoundment of water.
  7. Excavation or other digging unless otherwise indicated.
- C. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION

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## SECTION 32 92 00-TURF AND GRASSES

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

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

## 1.02 SUMMARY

- A. Section Includes:
  - 1. Hydroseeding.
  - 2. Turf renovation.

## 1.03 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Planting Soil: Existing, on-site soil; Contractor responsible to provide a soils analysis and recommendations from certified laboratory.
- C. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

## 1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
  - 1. Certification of each seed mixture. Include identification of source and name and telephone number of supplier.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
  - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
  - 2. Experience: Five years' experience in turf installation in addition to requirements in Section 01 40 00 "Quality Requirements."
  - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  - 4. Personnel Certifications: Installer's personnel assigned to the Work shall have certification in all of the following categories from the Professional Landcare Network:
    - a. Landscape Industry Certified Technician - Exterior.
    - b. Landscape Industry Certified Lawncare Manager.
    - c. Landscape Industry Certified Lawncare Technician.
  - 5. Pesticide Applicator: State licensed, commercial.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.09 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of planting completion.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be

obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.01 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Grass-Seed Mix: Proprietary seed mix as follows:
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Stover Pro Sportsfield Supreme – apply at seeding rate as recommended by manufacturer

2.02 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
  - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
  - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
  - 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.03 MULCHES

- A. As specified on plan.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils,

gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.02 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
  2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.03 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to Contractor supplied soil analysis report and recommendations from certified laboratory.
- B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade. Blend planting soil in place.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- E. General: prepare planting area for soil placement and mix planting soil according to section 32 91 13 "soil preparation."
- F. reduce elevation of planting soil to allow for soil thickness of sod.
- G. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- H. Before planting, obtain architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.04 TURF RENOVATION

- A. Renovate existing turf where indicated.

- B. Renovate turf damaged by Contractor's operations, such as trenching, irrigation system installation, grading, storage of materials or equipment and movement of vehicles.
  - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
  - 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, thatch and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth per soils suitability report and recommendations.
- I. Apply soil amendments per soils report and recommendation.
- J. Apply hydroseed as required for new turf.
- K. Water newly planted areas and keep moist until new turf is established.

### 3.05 WEED ABATEMENT OPERATIONS

- A. The irrigation system and finish grade shall be completed prior to weed abatement operations. All new planting areas to receive weed abatement operations.
- B. Contractor shall spray existing turf area with Round Up Pro at a 4% rate per all manufacturer's recommendations.
- C. Contractor shall operate the irrigation system to keep planting areas uniformly moist for a period of three (3) weeks (21 consecutive calendar days). At the end of the three (3) week period, Contractor shall spray all visible weeds with Round Up Pro. Application method shall be as recommended by manufacturer. After spraying, planting areas shall remain unwatered for a minimum of forty-eight (48) hours. Remove grass and weeds from site and amend soil per soil report and recommendations.
- D. Water seven (7) additional consecutive calendar days from the first application, and apply a contact herbicide as may be necessary. Repeat steps in "C" minimum of three times. After third spraying, water shall not be applied for an additional forty-eight (48) hour period. Applications shall continue at seven (7) day intervals as determined by District/Owner.



- E. Contractor shall apply spray chemicals when air currents are still; preventing drifting onto adjoining property and preventing any toxic exposure to persons whether or not they are in or near the project.
- F. Weed and debris shall be disposed of off-site.

3.06 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, commercial slow-release fertilizer as specified in soils report, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
  - 1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
  - 2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight (or as recommended by manufacturer), and seed component is deposited at not less than the specified seed-sowing rate.
  - 3. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

3.07 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
  - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
  - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
  - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain irrigation system per plan.
  - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
  - 2. Water turf as required to establish seed and turf.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

- 1. Mow bermudagrass to a height of 1/2 to 1 inch.
  - D. Turf Post fertilization: Apply fertilizer per soil report recommendations
- 3.08 SATISFACTORY TURF
- A. Turf installations shall meet the following criteria as determined by Architect:
    - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 100% coverage and a playable ballfield.
  - B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.
- 3.09 CLEANUP AND PROTECTION
- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
  - B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
  - C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
  - D. Remove nondegradable erosion-control measures after grass establishment period.
- 3.10 MAINTENANCE SERVICE
- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:
    - 1. Seeded Turf: 90 days from date of Substantial Completion.
      - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

END OF SECTION

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## SECTION 32 93 00 -PLANTS

## PART 1 - GENERAL

## 1.01 SUMMARY

## A. Section Includes:

1. Plants.

## 1.02 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
- C. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 32 91 13 "Soil Preparation" for drawing designations for planting soils.
- D. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

## 1.03 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

## 1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples of each type of mulch.
- C. Photographs of each type of plant.

## 1.05 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Sample warranty.

1.06 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.07 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  - 1. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- B. Handle planting stock by root ball.
- C. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1.09 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
    - b. Structural failures including plantings falling or blowing over.
  - 2. Warranty Periods: From date of planting completion and acceptance by Owner.
    - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
    - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.

PART 2 - PRODUCTS

2.01 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

2.02 FERTILIZERS

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
  - 1. Size: 21-gram tablets.
  - 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.03 MULCHES

- A. Organic Mulch: Size range ½”-1 ½” as shown on drawings

2.04 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

PART 3 - EXECUTION

3.01 WEED ABATEMENT OPERATIONS

- A. The irrigation system and finish grade shall be completed prior to weed abatement operations.
- B. Contractor shall operate the irrigation system to keep planting areas uniformly moist for a period of three (3) weeks (21 consecutive days). At the end of the three (3) week period, Contract shall spray all visible weeds with a contact herbicide. Application method shall be as recommended by manufacturer. After spraying, planting areas shall remain unwatered for a minimum of forty-eight (48) hours. Remove weeds from site.
- C. Water seven (7) addition consecutive calendar days from the first application, and apply a contact herbicide as necessary. After second spraying, water shall not be applied for

additional forty-eight (48) hour period. Applications shall continue at seven (7) day intervals as determined by the City/Owner.

- D. Contract shall apply spray chemicals when air currents are still; preventing drifting onto adjoining property and preventing any toxic exposure to persons whether they are in or near the project.
- E. Weeds and debris shall be disposed of off-site.

3.02 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 32 91 13 "Soil Preparation."
- B. Placing Planting Soil: Blend planting soil in place.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.03 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
  - 1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
  - 2. Excavate approximately three times as wide as ball diameter.
  - 3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
  - 4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

3.04 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

1. Backfill: Amended planting soil as indicated in Section 32 91 13 Soil Preparation
2. Container-Grown Stock: Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
  - a. Quantity: As recommended by manufacturer.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

3.05 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Maintain 80” minimum bottom of crowns to adjacent horizontal surfaces

3.06 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines apart as indicated on Drawings in even rows with triangular spacing.
- B. Use amended planting soil as specified in Section 32 91 13 Soil Preparation for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.07 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.



- D. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- E. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- F. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

### 3.08 MAINTENANCE SERVICE

- A. Maintenance Service: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
  - 1. Maintenance Period for Trees and Shrubs: 12 months from date of planting completion and acceptance by Owner.
  - 2. Maintenance Period for Ground Cover and Other Plants: Six months from date of planting completion and acceptance by Owner.

END OF SECTION

SECTION 331100 - SITE WATER DISTRIBUTION UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Site water distribution systems located outside the building perimeter, extending to an existing water line or meter.

B. Related Requirements:

1. Division 01 - General Requirements.
2. Division 22 – Plumbing.
3. Section 31 2323 - Excavation and Fill for Utilities.
4. Section 32 0117 - Pavement Repair.
5. Section 32 1313 - Site Concrete Work.
6. Section 33 3000 - Site Sanitary Sewer Utilities.

1.02 SUBMITTALS

A. Shop Drawings: Submit site plan indicating locations of lines, valves, and related appurtenances.

B. Product Data: Manufacturer’s catalog data for materials. Include technical data for accessories, gaskets, joints and couplings.

C. Certificates: Certificates attesting that tests set forth in referenced publications have been performed, and the performance requirements have been satisfied.

1.03 QUALITY ASSURANCE

A. Comply with the following as a minimum requirement:

1. ANSI:
  - a. ANSI B16.18 Cast Copper Alloy Solder Joint Pressure Fittings.
  - b. ANSI B18.5.2.1M Metric Round Head Short Square Neck Bolts.
2. ASME:
  - a. ASME B16.3 Malleable Iron Threaded Fittings.
  - b. ASME B16.4 Grey Iron Threaded Fittings.
  - c. ASME B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
  - d. ASME B16.26 Cast Copper Alloy Fitting for Flared Copper Tubes.
  - e. ASME B18.2.2 Nuts for General Applications (Inches Series).
  - f. ASME B18.5.2M Metric Round Head Square Neck Bolts.
3. ASTM:
  - a. ASTM A47 Standard Specification for Ferritic Malleable Iron Castings.
  - b. ASTM A48 Standard Specification for Gray Iron Castings.
  - c. ASTM A53 Standard Specification for Pipe, Steel, Black and Hit-Dipped, Zinc-Coated Welded and Seamless.

- d. ASTM A307 Standard Specification for Carbon Steel bolts and Studs, 60,000 psi Tensile Strength.
  - e. ASTM A536 Standard Specification for Ductile Iron Castings.
  - f. ASTM A563 Standard Specification for Carbon and Alloy Steel Nuts.
  - g. ASTM B61 Standard Specification for Steam or Valve Bronze Castings.
  - h. ASTM B62 Standard Specification for Composition Bronze or Ounce Metal Castings.
  - i. ASTM B88 Standard Specification for Seamless Copper Water Tube.
  - j. ASTM C94 Standard Specification for Ready-Mixed Concrete.
  - k. ASTM D1527 Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe, Schedules 40 and 80.
  - l. ASTM D1785 Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.
  - m. ASTM D2235 Standard Specification for Solvent Cement for ABS Plastic Pipe, and Fittings.
  - n. ASTM D2241 Standard Specification for PVC Plastic Pipe Fittings, Schedule 40.
  - o. ASTM D2282 Standard Specification for ABS Plastic Pipe.
  - p. ASTM D2466 Standard Specification for PVC Plastic Pipe Fittings, Schedule 80.
  - q. ASTM D2468 Standard Specification for ABS Plastic Pipe Fittings, Schedule 40.
  - r. ASTM D2564 Standard Specification for PVC Plastic Piping Systems.
  - s. ASTM D2774 Standard Practice for Underground Installation of Thermoplastic Pressure Piping.
  - t. ASTM D2855 Standard Test Method for Making Solvent-Cemented Joints with PVC Pipe and Fittings.
  - u. ASTM D3139 Standard Specification for Joints Pressure Pipes Using Flexible Elastomeric Seals.
  - v. ASTM F402 Standard Practice for Safe Handling Of Solvent Cements, Primer and Cleaners Used for Joining Thermoplastic Pipes and Fittings.
  - w. ASTM F477 Standard Specification for Elastomeric Seals for Joining Plastic Pipes.
4. American Water Works Association (AWWA) Standards:
- a. AWWA C104/A21.4 Cement-Mortar Lining For Ductile-Iron Pipe and Fittings For Water.
  - b. AWWA C110/A21.10 Ductile-Iron and Gray-Iron Fittings, 3 inches through 48 inches, for Water and Other Liquids.
  - c. AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron pressure Pipe and Fittings.
  - d. AWWA C153/A21.53 Ductile-Iron Compact Fittings, 3 inches through 16 inches, for Water and Other Liquids.
  - e. AWWA C500 Metal Seated Gate Valves for Water and Sewage Systems.
  - f. AWWA C503 Wet- Barrel Fire Hydrants.
  - g. AWWA C508 Swing-Check Valves for Waterworks Service, 2 inches through 24 inches NPS.
  - h. AWWA C509 Resilient Seated Gate Valves for Water and Sewerage Systems.
  - i. AWWA C511 Reduced-Pressure Principal Backflow-Prevention Assembly.

- j. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances.
  - k. AWWA C651 Disinfecting Water Mains.
  - l. AWWA C800 Underground Service Line valves and Fittings.
  - m. AWWA C900 PVC Pressure Pipe, 4 inches through 12 inches, for Water Distribution.
  - n. AWWA M23 PVC Pipe - Design and Installation.
  - 5. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
    - a. MSS SP-80 Bronze Gate, Globe, Angle and Check Valves.
  - 6. Uni-Bell PVC Pipe Association (UBPPA):
    - a. UBPPA UNI-B-3 Installation of PVC Pressure Pipe.
    - b. UBPPA UNI-B-8 Direct Tapping of PVC Pressure Water Pipe.
    - c. UBPPA UNI-B-13 Standard Performance Specification on joined restrained devices for use with Poly Vinyl Chloride (PVC) Pipe.
  - 7. Underwriters Laboratories Inc. (UL):
    - a. UL 246 Hydrants for Fire-Protection Service.
    - b. UL 262 Gate Valves for Fire-Protection Service.
    - c. UL 312 Check Valves for Fire-Protection Service.
    - d. UL 789 Indicator Posts for Fire-Protection Service.
  - 8. National Pollutant Discharge Eliminations System (NPDES):
    - a. Comply with storm water requirements of general permit for storm water discharges when flushing pipe systems including storm drains and maintaining logs.
- B. Provide valves from the same manufacturer.
- C. No pipe, pipe fitting, or any other fitting or fixture intended to convey or dispose water for human consumption for drinking or cooking is allowed in the domestic plumbing system, if they do not meet the low lead definition of Health and Safety Code 116875. Weighted average lead content of the wetted surface area of pipes, fittings and fixtures may not exceed 0.25 percent.

1.04 PRODUCT HANDLING

- A. Store items above ground on platforms, skids, or other required supports.
- B. Protect materials from direct sunlight.
- C. Protect coating and linings on piping, fittings, and accessories from damage. Repair and/or replace damaged coatings or linings.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Pipe:
  - 1. Pipe sizes up to 2.5 inches shall be copper water tubing, Type L hard, ANSI H23.1, ASTM B88, IAPMO IS. Muller Brass, Cambridge-Lee Halstead, or equal.

2. If soil report indicates corrosive condition, an approved protective wrap shall be used to completely isolate and protect underground copper tubing and extend past the surface a minimum 12 inches. The excess wrapping shall be trimmed down and taped to copper tubing with 10 mill PVC pipe tape at grade level of concrete or asphalt.
  3. Underground pipe sizes 3-inch and larger shall be PVC water main pipe material complying with ASTM D1784 Cell Class 12454B and AWWA C900. Piping shall be plain end or gasket bell end, pressure class 200 (DR14) with cast iron pipe equivalent outside diameter.
  4. Stainless steel pipe, sizes 2-inch and larger may be used above or below ground in lieu of copper, ductile iron, or plastic. Stainless steel pipe shall be schedule 10 or 304 above ground and schedule 316 below ground conforming to ASTM A312. Flanges shall be HR carbon steel plated conforming to ASTM A36. Flange exterior coating shall be Zinc plated conforming to ASTM B633. Welding wire/rod shall be 308L SS wire rod conforming to ASME SF A5.9.
    - a. Underground connections shall be welded stainless steel pipe or made with a welded flange connection.
    - b. Above ground connections may be with either flange or grooved Victaulic type coupler. Victaulic couplers shall be classified according to ANSI/NSF 61.
- B. Poly Vinyl Chloride (PVC) Water Main Fittings shall be gray-iron or ductile iron conforming to AWWA C110/A21.10 or AWWA C153/A21.53 and shall have cement mortar lining conforming to AWWA C104/A21.4, standard thickness unless otherwise indicated on Drawings. Fittings shall be mechanical joints.
- C. PVC Joints and Jointing Materials:
1. Pipe joints shall be push on as specified in ASTM D3139.
  2. Joints between pipe and metal fittings, valves, and other accessories shall be mechanical joints as specified in AWWA C111/A21.11.
  3. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling installation.
  4. Gaskets for push on joints for pipe shall conform to ASTM F477.
  5. Gaskets for push on joints and compression type joints or mechanical joints for connections between pipes and metal fittings, valves, and other accessories shall be as specified in AWWA C111/A21.11.
  6. Sleeve-type mechanically coupled joints may be provided instead of push-on joints on plain-end PVC plastic joints. Comply with requirements of ASTM D3139.
- D. Gates Valves for PVC:
1. Non-rising stem type with resilient wedge gates or iron body bronze wedge gates and mechanical joint ends conform to AWWA C500.
  2. Non-rising stem type with mechanical joints ends shall conform to AWWA C509.
  3. Valves designed for a working pressure of 175 psi shall be inside-screw type with operating nut, and resilient wedge type gate. Valve shall be provided with mechanical joints as required for the pipe to which it is intended to connect.
  4. Valves with UL listing of 262 shall conform to AWWA C500. Valves shall open by counter-clockwise rotation of valve stem.

5. Stuffing boxes shall be provided with O-ring stem seals and shall be bolted and constructed to permit easy removal of parts for repair.
  6. Sleeve type mechanical couplings may be provided instead of mechanical and push on joint ends.
  7. Valve ends and gaskets for connection to sleeve type mechanical couplings shall conform to specified requirements for the joint or coupling.
- E. Gate Valves in Valve Pits:
1. Outside screw and yoke rising stem type valves with resilient wedge gates and flanged ends shall conform to AWWA C500.
  2. Outside screw and yoke rising stem type valves with flanged ends shall conform to AWWA C509.
  3. Outside screw and yoke type Valves with double disc gates or split-wedge type gate and flanged ended ends shall be designed for 175 psi and conform to UL 262.
  4. Provide valves with hand wheels that open by counterclockwise rotation of the valve stem.
  5. Stuffing boxes shall be provided with O-ring stem seals and shall be bolted and constructed to permit easy removal of parts for repair.
- F. Check Valves for PVC:
1. Valves shall be swing-check type conforming to AWWA C508 or UL 312.
  2. Valves shall be provided with cast iron or steel body and cover, flanged ends and clear port opening.
  3. Valves shall be designed for a working pressure of 175 psi.
- G. Valve Boxes: 14 ¾-inch by 20-inch by 12-inch cast concrete with cast iron, traffic grade cover marked "WATER" (for use over water valves).
1. Brooks 36-H MB with No. 36-T cast iron cover EISEL 363.5, or equal.
- H. Mechanical Thrust Restraint:
1. Restraint shall be incorporated into the follower gland.
  2. Restraint shall consist of individually actuated wedges that increase resistance to pull out as internal pressure or external forces increase.
  3. Gland shall be ductile iron conforming to ASTM A536.
  4. Provide twist off nuts and tee-head bolts of the same size to ensure proper actuating of restraint devices.
  5. Restraining device shall be provided with pressure rating equal to that of the pipe on which it is installed.
  6. Restraining gland shall be UL listed.
  7. Mechanical thrust restraint devices shall be EBAA Iron "Megalug" or equal.
- I. Restraint Device Adapters:
1. Restrained flange adapters shall be provided instead of threaded or welded flange spool pieces on plain end of ductile iron or PVC pipe.
  2. Flange adapters shall be manufactured of ductile iron conforming to ASTM A536 and be provided with flange bolt circles compatible with ANSI/AWWA C115/A21.15.
  3. Restraint of flange adapter shall consist of a multiple number of individually actuated gripping wedges to maximize restraint capability.

4. Torque limiting actuating screws shall be provided to insure proper initial set of gripping wedges.
  5. Flange adapter shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow at least 0.6 inch of gap between end of pipe and mating flange without affecting integrity of seal.
  6. Flange adapter shall be provided with a safety factor of at least 2:1 for rated pressure.
  7. Restraint device adapters shall be EBAA Iron "Megaflange", or equal.
- J. Tracer Wire for Nonmetallic Pipes: Tracer wires shall be electrically continuous #14 copper tracer wire, Type TW, blue plastic covered for domestic water and red for fire sprinkler. (Aluminum wire is prohibited). Provide in sufficient length to be continuous over each installed section of nonmetallic pipe.
- K. Pipe markers shall be a concrete plaque inscribed with the word "WATER."
- L. Water Service Line Materials:
1. Copper Tubing: Copper tubing shall conform to ASTM B88, Type L.
  2. Fittings for Copper Tubing: Fittings for solder-type joints shall conform to ANSI B16.18 or ASME/ANSI B16.22. Fittings for compression-type joints shall conform to ASME/ANSI B16.26, flared tube type.
  3. Water Service Line Appurtenances:
    - a. Corporation stops shall be ground key type; manufactured of bronze conforming to ASTM B61 or ASTM B62; and suitable for the working pressure of the system. Ends shall be suitable for solder-joint or flared tube compression type joint connection. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C800; coupling nut for connection to flared copper tubing and shall conform to ASME/ANSI B16.26.
    - b. Goosenecks shall be type K copper tubing. Joint ends for goosenecks shall be as required for connecting to corporation stop and service line. Where multiple gooseneck connections are required for individual service, connect goosenecks to service line through brass or bronze branch connection; the total clear area of branches shall be at least equal to clear area of service line. Length of goosenecks shall be as indicated or required.
    - c. Curb or service stops shall be ground key, round way, inverted key type; bronze, conforming to ASTM B61 or ASTM B62; and rated at 150 psi. Ends shall be as required for connection to service piping. Arrow shall be cast into body of curb or service stop indicating direction of flow.
    - d. Gate valves 2.5-inch and larger shall be MSS SP-80, Class 150, solid wedge, or resilient wedge gate, and non-rising stem. Valves shall be provided with flanged end connections. Provide hand wheel operators if easily accessible. Provide operating nut if inside a vault, pit or valve box.
    - e. Gate valves in valve pits 2-inch, and smaller shall be MSS SP-80, Class 150, bronze, solid wedge, inside screw, rising stem. Valves shall be provided with flanged end connections or threaded end connections with union on one side of valve and hand wheel operator.
    - f. Valve boxes shall be provided at each gate valve installed underground. Valve boxes shall be a size suitable for valve on which it is installed.

M. Water meter will be installed by water purveyor for the area, unless noted otherwise.

N. Strainers:

STR-1 Description: Wye type with monel or stainless steel strainer cylinder (manufacturer’s standard mesh), and gasketed machine strainer cap. Where indicated on Drawings, provide with valved (globe valve) blow out piping, same size as blow out plug:

2-inch and smaller: C.M. Bailey #100-A, bronze, 250 pound, or ductile iron with fusion bonded epoxy coating.

2 ½-inch and larger: Watts 77F-DI-FDA-125 pound, or other ductile iron fusion bonded epoxy coated flanged strainer, conforming to ASTM A312 for the strainer body, and ASTM A240 for the stainless steel strainer element. (No iron body strainer shall be used on potable water that is not fusion bonded epoxy coated inside and out.)

C.M.Bailey, Armstrong, Wilkins, Watts, or equal.

STR-2 “Y” pattern, cast iron bodies, 125 psi, monel screen 16 square. mesh. Open area at least twice the cross-sectional area of IPS pipe in which strainer is installed and may be woven wire or perforated type. Screwed ends for sizes up to 2-inch, flanged ends for 2 ½-inch and larger perforations, in accordance with the following:

Bailey #100, Armstrong, Rp & C , Keckley, or equal.

STR-3 Bucket type, flange, semi-steel body, 125 psi, stainless steel screen with 1/8 inch diameter perforations (mounted above grade for water service). All sizes, for mains serving fire sprinkler risers:

Bailey #1, Zurn 150 Series, Rp 7 C, Watts 97fb-Fsfe, or equal.

STR-42” and larger: Watts 077-F-SS Stainless steel flange type strainer, or equal conforming to ASTM A312 for strainer body, ASTM A240 for the SS strainer element and ASTM A36 for base flange material.

O. Backflow Preventer Assemblies:

1. Assembly shall be provided with flanged connections, ductile iron with fusion bonded epoxy coated construction, bronze, or stainless steel.
2. Backflow preventer shall be suitable for cold water working pressure of 175 psi.
3. Internal parts shall be designed for replacement without removing valves from line.
4. Double check backflow preventer assembly shall consist of two independently acting spring cam or poppet style check valves, 2 shut-off valves and 4 test cocks. Check valve shall be designed to provide drip tight closure against reverse flow, low pressure drop at maximum flow capacity. Spring-loaded checks shall cause valve to seal against a higher inlet pressure than outlet pressure when there is no flow.



5. Double check backflow preventer assembly shall meet AWWA Standard C510-89. Assembly shall be Ames 2000ss, Febco 850, Watts 709, Wilkins 350, or equal.
6. Reduced pressure backflow preventer assembly shall consist of two check valves located between two shut-off vales with an area of reduced pressure between two check valves and a relief device arranged to discharge to atmosphere.
  - a. Comply with AWWA Standard C511.
  - b. Fluctuation in piping pressure shall not cause cycling. Backflow preventer shall automatically maintain low pressure zone to positively prevent backflow of water into system. Assembly shall automatically indicated failure of any part vital to backflow prevention by the continuous discharge relief device.
  - c. Reduced pressure backflow preventer assembly shall be Cla-Val Model RP-4, or equal.
7. Backflow prevention assemblies (devices), shall be tested and certified by a certified backflow tester, and a test report shall be provided to the water agency having jurisdiction. Testing shall be performed in the presence of the Project Inspector.

PART 3 - EXECUTION

3.01 EXCAVATION, BACKFILLING AND COMPACTING

- A. Conform to requirements in Section 31 2323 - Excavation and Fill for Utilities.

3.02 PIPE INSTALLATION

- A. Project site water lines shall terminate approximately 5 feet from buildings, unless otherwise indicated on Drawings. Temporarily cap or plug terminals for future connection to building.

3.03 CLEARANCES OF WATER LINE

- A. Building or Structures: Two feet.
- B. Parallel to Sewer Line:
  1. Water line 4-inch or less in diameter shall not be installed in a common trench with the building sanitary drain unless the bottom of the water line is at least 12 inches above the top of the building sanitary drain or where the water line is installed on a solid shelf excavated on one side of the common trench with a minimum clear horizontal distance of 12 inches from the building sanitary drain.
  2. Water mains 6-inch and larger in diameter shall be separated from the Project site sanitary sewer, receiving more than one building sanitary drain or acid pipeline, in accordance with the requirement of the State of California, Human and Welfare Agency, Department of Health Services.
- C. Crossing Sewer Line:
  1. A water main shall be separated from sanitary sewer in accordance with the requirements of the State of California Administrative Code, Title 22, Section 64630(e)(2).

2. Install water main a minimum of 12 inches clear, above or below a sanitary sewer.
  3. A water main 6-inch or greater in diameter, crossing under a Project site sanitary sewer line, shall be installed with joints located at least 10 feet away from each side of the sanitary sewer line.
  4. A water main 6-inch or greater in diameter, crossing over a Project site sanitary sewer line, shall be installed with joints located at least 4 feet away from each side of a purple pipe or sanitary sewer line.
- D. Install water mains no closer than 10 feet horizontally clear from the edge of sewage leach fields, seepage pits, and septic tanks.

#### 3.04 PIPE INSTALLATION AND JOINING

- A. Remove fins and burrs from pipe and fittings.
- B. Clean piping, fitting, valves, and accessories before installing. Maintain items in a clean condition.
- C. Provide proper facilities for lowering sections of pipe into trenches. Do not drop into piping, fittings, or other materials into trenches. Accurately cut pipe and install without springing or forcing. Replace any piping or fitting that does not provide sufficient space for proper installation of joining material.
- D. Blocking or wedging between bells and spigots is not permitted. Install bell and spigot pipe with bell end pointing in the direction of flow.
- E. Install piping to the lines and grades indicated or required. Low points and dips are not permitted. Support piping at proper elevation and grade with secure and uniform supports. Wood support blocking is not permitted. Where sand cement slurry will not be furnished for backfill, install piping so that full length of each section of pipe and each fitting will solidly rest on pipe bedding. Excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated or required for installation. Provide proper allowances and devices for expansion and contraction of piping and systems.
- F. Maintain trenches free of standing water until pipe joints have been installed.
- G. At the end of each day close open ends of pipe with temporary caps of the same material as the pipe.
- H. Do not install piping when trench or weather conditions prevent proper installation.

#### 3.05 INSTALLATION OF TRACER WIRE AND PIPE MARKERS

- A. Tracer Wire: Install continuous length of tracer wire for full length of each run of nonmetallic pipe. Fasten wire to top of pipe in such a manner that it will not be displaced during construction operations. Wire shall be fastened to pipe at not greater than 20-foot intervals. Wire shall terminate above finished grade with a 12-inch lead taped around each riser. Provide a tracer wire to grade under a permanent marker where straight-line transitions of metallic to non-metallic pipe are installed.

- B. Underground Pipe Markers: Provide markers at grade where non-metallic pipe is installed and for each horizontal change in direction.

### 3.06 CONNECTIONS TO EXISTING WATER LINES

- A. After Project Inspector has inspected installation, perform connections to servicing water lines. Schedule service shutdown for connecting new system at a time causing minimum disruption.
- B. Use a tap or drilling machine with valve and mechanical joint type sleeves for connections to waterlines under pressure, only if other means of scheduling a shutdown time have been unsuccessful, and with the approval of the responsible engineer, and Project Inspector.
- C. Bolt sleeves around mains; bolt valve conforming to AWWA C500 to branch. Open valve, attach drilling machine, perform tap, close valve, and remove drilling machine, without interruption of service. Notify the Project Inspector in writing at least five days prior to the date of scheduled connections.

### 3.07 INSTALLATION OF PVC PLASTIC WATER MAINS

- A. Unless otherwise indicated, install pipe and fittings as specified and in accordance with UBPPA UNI-B-3 and AWWA M23, Chapter 7, "Installation".
- B. Jointing:
  - 1. Provide push on joints with elastomeric gaskets specified for this type of joint, furnishing either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push on joint connections, provide pipe with push on joint ends furnished with factory installed bevel; for push on joint connections to metal fittings, valves and other accessories, square cut spigot end off pipe end.
  - 2. Provide push on joint lubricant recommended by manufacturer.
  - 3. Install push on joints for pipe-to-pipe connections in accordance with UBPPA UNI-B-3 and AWWA M23, Chapter 7, "Installation."
  - 4. Install push on joints for connection to fittings, valves, and other accessories in accordance with requirements of UBPPA Uni-B-3 and with applicable requirements of AWWA C600.
  - 5. Compression-type joints/mechanical-joints with gaskets, glands, bolts, nuts and internal stiffeners shall be installed in accordance with the requirements of UBPPA UNI-B-3 and AWWA C600 and Appendix A to AWWA C 111/A21.11.
    - a. Square cut spigot off end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel.
  - 6. Sleeve-type mechanical couplings shall be provided in strict accordance with coupling manufacturer's recommendations using internal stiffeners as specified for compression-type joints.
- C. Provide mechanical thrust restraint devices for anchorage and piping unless thrust blocks are indicated on the Drawings. Thrust blocks shall be installed in accordance with the requirements of UBPPA UNI-B-3 except that size and location of blocks shall be as indicated. Thrust blocks shall be provided as specified in Section 32 1313 - Site Concrete Work.

### 3.08 INSTALLATION OF VALVES

- A. Provide gate valves conforming to AWWA C500 and UL 262 in accordance with AWWA C600 for valve and fitting installation and with recommendations of AWWA C500 Appendix “Installation, Operation, and Maintenance of Gate Valves”.
- B. Provide gate valves conforming to AWWA C600 in accordance with AWWA C509 for valve and fitting installation and with recommendations of AWWA C500 Appendix “Installation, Operation, and Maintenance of Gate Valves”.
- C. Provide gate valves on PVC water mains in accordance with AWWA M23 Chapter 7, “Installation.”
- D. Provide check valves and fittings in accordance with applicable requirements of AWWA C600 unless noted otherwise on the Drawings.
- E. Provide gate and check valve joints as specified for the type of joints between pipe and fittings.

3.09 INSTALLATION OF BACKFLOW PREVENTERS

- A. Install reduced pressure backflow preventers to comply with RULE 16D of LADWP in the jurisdictional boundaries of Los Angeles Department of Water and Power.

3.10 WATER SERVICE LINE CONNECTION TO WATER MAINS

- A. Connect service line to main by corporation stop and gooseneck. Install service stop as indicated on the Drawings. Connect service lines to PVC plastic water mains in accordance with UBPPA UNI-B8 and AWWA M23, Chapter 9, “Service Connections”.
- B. Special Requirements for Plastic Piping: Unless otherwise indicated, install pipe and fittings in accordance with ASTM D2774 and ASTM D2855. Handle solvent cements for plastic pipe jointing in accordance with ASTM F402. Install joints according to ASTM D2855. Install other joints to materials other than pipe materials in accordance with plastic pipe manufacturer’s recommendations.
- C. Connect plastic pipe service lines to corporation stops and gate valves according to plastic pipe manufacture’s recommendations.

3.11 INSTALLATION OF STRAINERS:

- A. Strainers shall be installed on each water main downstream of the meter, above grade at the pressure regulating station. When a pressure regulating station (assembly) is not provided, “wye” type flange strainer shall be provided, with a shut off valve on the inlet and the outlet side.
- B. If the water main is serving fire sprinkler risers or hydrants, then an approved fire service strainer shall be used: Watts 97DB-FSFE, or equal.

3.12 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. When water piping has been installed and tested, sterilize system before use and/or Substantial Completion.

- B. Inject solution of liquid chlorine or sodium hypochlorite and water containing at least 50 PPM of free chlorine into a system in a manner to ensure that entire system is completely filled with solution. During this procedure operate valves and test outlets for residual chlorine. Continue injection until outlets indicate at least 59 PPM of free chlorine.
- C. After injection, isolate system and hold solution in retention for a period of at least 8 hours. Perform tests for residual chlorine after retention. If such tests indicate less than 50 PPM of residual chlorine, repeat entire procedure. After satisfactory sterilization has been verified, flush entire system until traces of chlorine have been removed or until chlorine content is no greater than in existing water supply.

3.13 ELECTROLYSIS PREVENTION

- A. A minimum 6-inch long brass nipple shall be installed at locations specified or as required. Flanges shall be provided with a complete insulating component consisting of; gasket bolt sleeves and bolt washers. Dielectric insulators shall be installed at locations indicated or as required. Dielectric fittings are prohibited.
- B. Where steel or cast iron below grade connects to copper or brass piping above grade, the transition from steel or cast iron pipe to copper or brass pipe shall be installed in an above grade accessible location.
- C. Underground connections between dissimilar metals shall be in accessible yard boxes.
- D. Above ground dielectric connections shall be exposed.

3.14 ABANDONING WATER LINES AND STRUCTURES

- A. Water lines and appurtenances to be abandoned in place shall be cut and removed from areas where new Work is being installed.
- B. Cap or plug abandoned existing drain lines below grade in a yard box and according to CBC.

3.15 TESTS AND INSPECTIONS

- A. Provide labor, equipment, materials, test equipment and incidentals required for performing required field tests.
- B. Tests shall not be performed for five days after concrete thrust blocks have been installed.
- C. Testing Procedure: Water mains and service lines shall be tested in accordance with applicable specified standard.
  - 1. Test PVC plastic water system in accordance with UBPPA UNI-B-3 for pressure and leakage. The amount of leakage from PVC piping shall not exceed the amounts given in UBPPA UNI-B-3, except that no leakage is permitted for joints installed with sleeve type mechanical couplings.
  - 2. Test water service lines in accordance with applicable requirements of AWWA C600. No leakage is permitted.

3. Pressure testing: Before pressure test, fill portion of piping being tested with water for a minimum of 24 hours. Provide hydrostatic pressure of at least 50 psi greater than the maximum working pressure of tested system, but no less than 200 psi hydrostatic test pressure for system piping of 2-inch in diameter and larger. Provide and maintain hydrostatic test pressure for at least two hours to ensure no leakage of any portion of piping or appurtenances under pressure test.

3.16 CLEANING

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

3.17 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

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## SECTION 333000 - SITE SANITARY SEWER UTILITIES

## PART 1 - GENERAL

## 1.01 SUMMARY

## A. Section Includes:

1. Site sanitary sewer systems from the building, to the existing site sanitary sewer.
2. Closed-circuit television inspection of sewer laterals.

## B. Related Requirements:

1. Division 01 - General Requirements.
2. Division 23 - Mechanical.
3. Section 31 2323 - Excavation and Fill for Utilities.
4. Section 32 0117 - Pavement Repair.
5. Section 32 1313 - Site Concrete Work.

## 1.02 SUBMITTALS

## A. Shop Drawings: Submit site plan denoting locations of lines, valves, and appurtenances.

## B. Product Data: Manufacturer's catalog data for materials. Include technical data for accessories, gaskets, joints and couplings.

## C. Certificates: Certificates attesting that tests set forth in referenced publication have been performed and the results required by design have been met.

## D. Closeout Submittal: Submit three DVD's of Closed-circuit television inspections performed. Include the following information:

1. Electronic Media Recordings: Visual and audio record of the entire length of pipe. For existing laterals identify problem areas, such as roots, cracks, fractures, broken pipe, and other unusual conditions found.
2. Digital Photographs of the pipe condition, connections, points of interest and defects found. Indicate distance of defects to a point of reference such as face of building or mainline.

## 1.03 QUALITY ASSURANCE

## A. Comply with the following as a minimum requirement:

1. Standard Specifications for Public Works construction, current edition.
2. California Plumbing Code, CPC, current edition.

## PART 2 – PRODUCTS

## 2.01 MATERIALS

## A. Pipeline:



1. Acid pipeline from neutralizing tank to building sanitary drain or Project site sanitary sewer: See Division 15 for corrosive waste piping.
  2. Building or Project site sanitary sewer:
    - a. Cast iron soil, hubless, service weight, with stainless steel-banded hubless coupling. FS WW-P-401, conforms to CISPI 310 and IAPMO IS 6. Manufactured by American Foundry, Tyler, or equal.
    - b. Vitrified clay extra strength with plain end, meeting the requirements of ASTM C700, installed with mechanical compression couplings. Joints conforming to ASTM C425. Installation shall be in accordance with ASTM C12. Manufactured by Mission Clay Products, or equal.
    - c. Acrylonitrile-Butadiene-Styrene Schedule 40 plastic drainpipe and fittings meeting the requirements of ASTM D2661 and D3311. Provide ABS solvent cement for piping and joint connections and install in accordance with IAMPO Standards IS 5, 9, and UPC Section 718.
- B. Cleanout Assemblies: Cleanout plug shall be line size.
1. In covered concrete-paved floors: Iron body with UPC recognized plug, top, and adjustable sleeve, cut-off ferrule, polished brass/nickel/bronze, and secured scoriated cover:
 

Square:	SMITH	JOSAM	ZURN	Equal
4053	56030-2	Z-1400		
Round:	SMITH	JOSAM	WADE	ZURN Equal
4033	56010-2	W-6000	Z-1400	
  2. Outside covered concrete-paved floors: Secured cover, extra heavy-duty, adjustable sleeve, cut-off ferrule, UPC recognized brass type plug, scoriated tractor type cover:
 

SMITH	JOSAM-	ZURN	WADE	Equal
4233	56050-2	Z-1402-HD	W-7030-Y	
  3. In yard boxes: Raised threaded head brass plug.  
WADE 8590A, SMITH, ZURN, JOSAM, or equal.
- C. Yard Boxes: Brooks No. 3-TL, NDS, EJIW, or equal, with cast-iron locking cover with the word "SEWER," embossed on the cover in one inch high upper case lettering.
- D. Concrete, Mortar and Related Materials: Conform to Section 32 1313 - Site Concrete Work, unless noted otherwise.
- E. Metal Covers, Frames and Accessories:
1. Conform to Section 206 – Miscellaneous Metal Items of the Standard Specifications for Public Works Construction.
  2. Metal Covers and Frames: Vandal-resistant design and construction.
  3. Hot-dip galvanize steel parts after fabrication and prior to assembly in accordance with Section 210 – Paint and Protective Coating of the Standard Specifications for Public Works Construction.
- F. Bedding Materials: Conform to the requirements of Section 31 2323 - Excavation and Fill for Utilities, as required.

## PART 3 – EXECUTION

## 3.01 SANITARY SEWER INSTALLATION

- A. Install sanitary sewers in a uniform alignment and slope to the point of connection as indicated. Before trench excavation, verify size, material, depth, and location of the point of connection.
- B. Pipe slope shall not be less than  $\frac{1}{4}$  inch per foot or 2 percent unless pipe inverts are indicated. Where invert elevations are indicated, install pipe at a uniform slope between inverts.
- C. Join pipes and fittings as recommended by the manufacturer.

## 3.02 CLEARANCE OF SANITARY SEWERS

- A. Buildings or Structures: Two feet.
- B. Parallel to Water Line:
  - 1. Building sanitary drain is not permitted to be installed in a common trench with a potable water line unless the bottom of the water line is at least 12 inches above the top of the sanitary sewer.
  - 2. In addition, the potable water line shall be installed on a solid shelf excavated on one side of the common trench with a minimum clear horizontal distance of 12 inches from the sanitary sewer or building sanitary waste drain.
  - 3. Project site sanitary sewer, receiving more than one building sanitary drain or acid pipeline, shall be separated from a potable water line in accordance with the requirements of the California, Health and Human Services Agency, Department of Public Health.
- C. Crossing Water Line:
  - 1. Building sanitary drain shall be installed a minimum of 12 inches below the potable water line.
  - 2. Project site sanitary sewer shall be separated from the potable water main in accordance with the requirements of the State of California Administrative Code, Title 22, Section 64630(e)(2).

## 3.03 MANHOLES

- A. Provide manholes in accordance with the Standard Plans for Public Works Construction, unless otherwise indicated.
- B. Adjust manholes in accordance with the sub-section 302-5.8 Manholes (and other structures) of the Standard Specifications for Public Works Construction.

## 3.04 CLEANOUTS

- A. Provide cleanout at the upper terminal for each sanitary pipeline, at intervals not exceeding 100 feet in straight run and any fraction thereof and for each aggregate horizontal change in direction exceeding 135 degrees.

- B. Install required cleanouts before back filling of horizontal pipelines.
- C. In unpaved and asphalt-paved areas, install cleanouts in yard boxes 2 inches below the yard box cover.
- D. In concrete-paved areas, extend cleanouts flush with finish grade.
- E. In traffic areas, install countersunk cleanout plugs where raised heads protrude.

### 3.05 ABANDONED SEWERS AND STRUCTURES

- A. Plug or cap every abandoned sanitary sewer within 5 feet of the property line in a code required manner.
- B. Demolish abandoned sanitary structures such as cesspool, septic tank, sewage pit, and manholes to a minimum depth of 5 feet below the finish grade, including removal of sewage. Disconnect any piping. After inspection, completely fill with earth, sand, gravel, cement-sand slurry, or other required material.

### 3.06 TESTING

- A. After installation, test each sanitary drain and/or sewer and each section between successive manholes for either infiltration or exfiltration. Test shall be conducted in accordance with Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.
- B. Where excessive ground water is encountered test the pipeline for infiltration.
- C. When infiltration or exfiltration exceeds allowable amounts as set forth in the Section 306 formula, perform repairs or replacements as necessary to comply with the required limits.

### 3.07 CLOSED-CIRCUIT TELEVISION INSPECTION

- A. Coordinate with Owner's Representative time and date of inspection. Project Inspector shall be present during the CCTV inspection.
- B. Clean laterals by hydraulic jet.
- C. Perform internal closed-circuit television inspection of lateral from the building to the public mainline. Record sewer in its entirety with no breaks or interruptions. Move camera at a speed no greater than 30 feet per minute, stopping for a minimum of ten seconds to record pipe connections, defects, and points of interest.
- D. Maintain technical quality, sharp focus and distortion free picture. Pan, tilt, and rotate as necessary to best view and evaluate connections, defects and points of interest.
- E. Closed-circuit Television Equipment: As a minimum equipment shall include:
  - 1. Television camera specially designed for pipe inspections, and operative in 100 percent humidity conditions.

2. Camera and television monitor capable of producing minimum 470H-line resolution color video picture.
3. Camera capable to inspect laterals as small as three inches up to 70 feet from sewer mainline.
4. Camera lighting shall be suitable to allow clear picture of inner wall at least ten feet in front.

F. Defective Work:

1. New Laterals: Defective Work found shall be repaired at Contractor's expense. Perform a new closed-circuit television inspection at no cost to Owner.
2. Existing Laterals:
  - a. If roots, sludge, or sediment material or other defect not related to the Work of this project impedes inspection, withdraw camera, restart inspection from opposite end and notify Owner's Representative of defects found.
  - b. If obstruction or stoppage was caused by Work related to this project, remove obstruction at no cost to Owner. Perform a new closed-circuit television inspection at Contractor's expense.

3.08 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

3.09 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

END OF SECTION

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## SECTION 334000 - STORM DRAINAGE UTILITIES

## PART 1 - GENERAL

## 1.01 SUMMARY

## A. Section Includes:

1. Catch basins, grates and frames; culverts; curb inlets; drainage pipes; sub-surface drains; manhole covers and frames; surface run-off collection or infiltration.
2. Stormwater treatment systems:
  - a. Biotreatment Devices.
  - b. Cartridge Media Filter Devices.
  - c. Infiltration BMPs.
  - d. Hydrodynamic Separation Devices.
  - e. Catch Basin Inserts.
3. Closed-circuit television inspection of storm drain lines.

## B. Related Requirements:

1. Division 01 - General Requirements.
2. Section 22 1000 - Plumbing.
3. Section 31 2323 - Excavation and Fill for Utilities.
4. Section 32 0117 - Pavement Repair.
5. Section 32 1313 - Site Concrete Work.

## C. Definitions:

1. BMP: Stormwater Best Management Practice.
2. Post Construction BMP: Devices installed by the Contractor for storm water management to be left on site after construction completion.
3. SWPPP: Storm Water Pollution Prevention Plan.

## 1.02 SUBMITTALS

- A. Shop Drawings: Submit site plan denoting locations of lines, valves, and appurtenances.
- B. Product Data: Manufacturer's catalog data for all required materials. Include technical data for accessories, information concerning gaskets, joints and couplings.
- C. Certificates: Certificates attesting that tests set forth in referenced publication have been performed and the results required by design have been met.
- D. Closeout Documents: At Substantial Completion submit to the Owner's Representative two CD's and one hard copy of the documents indicated in paragraphs 1 through 5 below:

1. Maintenance Log: Provide Microsoft Excel Spreadsheet including the following information:
  - a. Maintenance log and upkeep records of the installed Post Construction BMPs. Include the following headers as a minimum: “Date of Service”, “Location of BMP”, “Type of Maintenance or Service”, “Notes”, “Next Scheduled Preventive Maintenance Due”, and “Inspector Signature”.
  - b. Maintenance Requirements: Include the following headers as a minimum: “BMP Description”, “Location of BMP and Map Grid Location” and “Type of Maintenance or Service Needed”, i.e.; weekly, monthly, quarterly, etcetera. “Stock No.”, “Manufacturer Contact Information”, along with “Frequency” namely: weekly, monthly, quarterly, etcetera and “Special Instructions”.
2. Maintenance Manuals: Provide Maintenance Manual for storm drainage BMP components installed along with requirements, replacement or maintenance schedule and plans with the location of each BMP component. This manual shall include product information cut sheet, shop drawings, vendor information for each component and warranty.
3. Record drawings: ‘As-Built’ site plan(s) showing Post Construction BMP. Provide a copy of marked record set with red pencil identifying any variations from design documents.
4. Training Documentation:
  - a. OWNER attendees sign off training sheet.
  - b. Two DVD’s of materials covered in the training and components installed.
5. Post-Construction BMP Maintenance Plan: Submit complete Plan per Attachment “A”, edit per As-Built conditions and provide missing information.
6. Records of Closed-Circuit Television Inspection: At Substantial Completion submit to the Owner’s Representative three DVD’s of Closed-circuit television inspections performed. Include the following information:
  - a. Electronic Media Recordings: Visual and audio record of the entire length of pipe. For existing laterals identify problem areas, such as roots, cracks, fractures, broken pipe, and other unusual conditions found.
  - b. Digital Photographs of the pipe condition, connections, points of interest and defects found. Indicate distance of defects to a point of reference such as face of building or mainline.
  - c. Inspection Log: Provide written report including:
    - 1) Date and time of inspection.
    - 2) Name of School, Project, Contractor, and operator name.
    - 3) Location, material and size of pipe.
    - 4) Description of defects found.

1.03 QUALITY ASSURANCE

- A. Comply with the following as a minimum requirement: Standard Specifications for Public Works Construction, current edition.

1.04 TRAINING OF OWNER PERSONNEL

- A. At Substantial Completion and when the storm drainage system is fully operational, knowledgeable representatives from the contractor and manufacturer(s) of the components specified and installed at the site shall provide up to 8 hours of training. Date, time and location for the training shall be coordinated through the project Owner’s Representative. Have Owner attendees sign off training sheet and provide a copy to the Owner’s Representative.
  
- B. Training period shall cover but not be limited to the following:
  - 1. Explain the operation of storm drainage system and its design intent.
  - 2. Explain the maintenance requirements of every component of the system.
  - 3. Provide recommendations of practices to minimize or eliminate negative impact on the system.
  - 4. Provide maintenance schedule as recommended by the manufacturers for every component and review it with OWNER’s Maintenance and Operations staff.
  - 5. Conduct a site walk, identify every component of the system and demonstrate its operation.
  - 6. Training shall be conducted with the use of Maintenance log and Maintenance manual.

1.05 SURPLUS MATERIALS

- A. Provide sufficient additional materials for each component of BMP that requires replacement or service during the first year.

1.06 ATTACHMENTS

- A. The following attachments are included at the end of Section 33 4000:
  - 1. Attachment “A” - Post-Construction BMP Maintenance Plan.
  - 2. Attachment “B” – Post-Construction Water Balance Calculator.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Storm Drain Pipe:
  - 1. Reinforced Concrete Pipe (RCP): Provide in conformance with Section 207 - Pipe and Section 208 - Pipe Joint Types and Materials of the Standard Specifications for Public Works Construction.
  - 2. Ductile Iron Pipe (DIP): Provide in conformance with Section 207 - Pipe and Section 208 - Pipe Joint Types and Materials of the Standard Specifications for Public Works Construction.
  - 3. Annular High Density Polyethylene (HDPE): Provide in conformance with Section 207 - Pipe and Section 208 - Pipe Joint Types and Materials of the Standard Specifications for Public Works Construction.



- B. Perforated Subsurface Drain Pipe: Shop-perforated with perforations symmetrically located within a maximum arc of 160 degrees. Perforations shall provide a total open area of at least 0.3 square inches per linear foot of pipe, with a minimum of one perforation per linear foot, except for joint areas. Perforation shall be either holes or slots. Hole diameters of ¼ inch minimum to 3/8 inch maximum. Width of slots of 3/16 inch minimum to 5/16 inch maximum with slot length not exceeding 4 inches.
- C. Concrete, Mortar and Related Materials: Conform to Section 32 1313 - Site Concrete Work.
- D. Metal Covers, Grates, Frames and Accessories:
  - 1. Conform to Section 206 - Miscellaneous Metal Items of the Standard Specifications for Public Works Construction.
  - 2. Hot-dip galvanize steel parts after fabrication and before installation, in accordance with Section 210 - Paint and Protective Coatings of the Standard Specifications for Public Works Construction.
  - 3. Grates and Frames:
    - a. Vandal-proof design and construction.
    - b. ADA compliant, in conformance to CBC 11B-302.3.
    - c. Rated for vehicular traffic on areas intended for use by motor vehicles.
    - d. Hot-dip galvanized.
- E. Bedding Material for Pipe: Conform to the requirements of Section 31 2316 - Excavation and Fill for Paving or Section 31 2323 - Excavation and Fill for Utilities, as required.
- F. Subsurface Drain Fabric: Non-woven geotextile filter fabric,
  - 1. TenCate Geosynthetics Americas, Mirafi 140N.
  - 2. Propex Fabrics, Inc., Geotex 451.
  - 3. Approved Equal.
- G. Aggregate Around Perforated Pipe: 6 inches of gravel containing no particles finer than a 3/8 inch to 1/2 inch sieve opening size.
- H. Manhole Brick Mortar, Grout, and Plaster: Conform to Standard Specifications for Public Works Construction, Section 202 - Masonry Materials.

2.02 STORMWATER TREATMENT SYSTEMS

- A. Cartridge Media Filters
  - 1. Manufacturer: Baysaver Technologies Inc., Contech Construction Products Inc., CrystalStream Technologies, Oldcastle Precast Inc., or Equal.
  - 2. Products:
- B. Hydrodynamic Separation Devices
  - 1. Manufacturer: Rinker Materials, Oldcastle Precast Inc., Contech Construction Products Inc., Baysaver Technologies Inc., or Equal.

- 2. Products:
  - C. Catch Basin Inserts
    - 1. Manufacturer: AbTech Industries, Aquashield Inc., Contech Construction Products Inc., Ecosense International, Oldcastle Precast Inc., Nyloplat, FabCo Industries Inc., UltraTech International Inc., or Equal.
    - 2. Products:
  - D. Infiltration BMPs
    - 1. Manufacturer: Contech Construction Products Inc., Oldcastle Precast Inc., Hancor, Jensen Precast, Hydrologic Solutions Inc., StormTech LLC, StormTrap, Triton Stormwater Solutions, or Equal.
    - 2. Products;
  - E. Biotreatment Devices
    - 1. Manufacturer: DeepRoot Urban Landscape Products, Filterra Bioretention Systems, Modular Wetlands Systems, Storm Threat Systems or Equal.
    - 2. Products:
- 2.03 NAMEPLATES:
- A. Stainless steel or aluminium nameplate permanently fastened to BMP showing the following information:
    - 1. BMP ID number and BMP type.
    - 2. Next service day, followed by a one inch by four inch long blank space.
    - 3. Manufacturer name, model number, telephone number and stock ID number.
    - 4. Installation or production date.
    - 5. One inch by four inch blank space for Owner’s use.

PART 3 – EXECUTION

3.01 EXCAVATION, BACKFILLING AND COMPACTING

- A. Conform to the requirements of Section 31 2316 - Excavation and Fill for Paving or Section 31 2323 - Excavation and Fill for Utilities, as required.

3.02 INSTALLATION OF PIPE

- A. Conform to Section 306 - Underground Conduit Construction of the Standard Specifications for Public Works Construction.
- B. Non-ferrous drainpipe installed with less than 12 inches of cover to finish grade shall be provided with a 4 inch thick concrete pipe encasement.

3.03 DRAINAGE APPURTENANCES

- A. Catch basins, junction chambers, manholes, box culverts, outlet chambers and other drainage structures: Construct as indicated on Drawings and as specified in Section 32 1313 - Site Concrete Work.
- B. Ensure that Post Construction BMP have a visible identifying manufacturer tag with product identification, manufacturer contact information, date of last service and date of next service due.
- C. Provide storm drain stencil per City or County requirements as applicable.

3.04 STORMWATER TREATMENT SYSTEMS

- A. Post Construction Stormwater Best Management Practices (BMPs) shall be installed as shown on the Construction Documents.

3.05 ABANDONED DRAINAGE LINES AND STRUCTURES

- A. Cap or plug existing drain lines that are cut and abandoned and remove existing drainage structures that are abandoned.

3.06 CLOSED-CIRCUIT TELEVISION INSPECTION

- A. Coordinate with Owner’s Representative time and date of inspection. Project Inspector shall be present during the CCTV inspection.
- B. Clean laterals by hydraulic jet.
- C. Perform internal closed-circuit television inspection of lateral from the building to the public mainline. Record drain line in its entirety with no breaks or interruptions. Move camera at a speed no grater than 30 feet per minute, stopping for a minimum of ten seconds to record pipe connections, defects, and points of interest.
- D. Maintain technical quality, sharp focus and distortion free picture. Pan, tilt, and rotate as necessary to best view and evaluate connections, defects and points of interest.
- E. Closed-circuit Television Equipment: As a minimum equipment shall include:
  - 1. Television camera specially designed for pipe inspections, and operative in 100 percent humidity conditions.
  - 2. Camera and television monitor capable of producing minimum 470H-line resolution color video picture.
  - 3. Camera capable to inspect lines as small as three inches up to 70 feet from storm drain mainline.

- 4. Camera lighting shall be suitable to allow clear picture of inner wall at least ten feet in front.

F. Defective Work:

- 1. New Lines: Defective Work found shall be repaired at Contractor’s expense. Perform a new closed-circuit television inspection at no cost to Owner.
- 2. Existing Laterals:
  - a. If roots, sludge, or sediment material or other defect not related to the Work of this project impedes inspection, withdraw camera, restart inspection from opposite end and notify Owner’s Representative of defects found.
  - b. If obstruction or stoppage was caused by Work related to this project, remove obstruction at no cost to Owner. Perform a new closed-circuit television inspection at Contractor’s expense.

3.07 CLEANUP

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.
- B. Maintain Post Construction BMP after installation and keep a maintenance log to be turned over to Owner’s Representative at Substantial Completion.

3.08 PROTECTION

- A. Protect the Work of this section until Substantial Completion.

END OF SECTION

**ATTACHMENT "A"**

***POST-CONSTRUCTION BMP MAINTENANCE PLAN***

*Project:*

**OAK PARK UNIFIED SCHOOL DISTRICT**

*(Facility Name)*

***(Facility Location)***

***Date Prepared: (Date of Submission)***

*Prepared for:*

*Oak Park Unified School District*

*Address*

*Telephone Number*

*Prepared by:*

*Name of person(s)*

*Address*

*Telephone Number*

**I. INTRODUCTION**

**A. Project Description**

The proposed *[elementary/middle]* school project will be constructed on an approximately \_\_\_\_ acre site located \_\_\_\_\_. The majority of this new school project is in a *[flat/hillside]* area and initially covered with\_\_\_\_\_.

The proposed *[project name/scope]* project will be constructed on an approximately \_\_\_\_ acre area located at the *[north/south/east/west/center]* part of the campus. The majority of the project site is in a *[flat/hillside]* area and initially covered with \_\_\_\_\_.

**B. Site Conditions**

**Groundwater**

Per the geotechnical evaluation prepared by \_\_\_\_\_, groundwater *[was/ was not]* encountered *[at \_\_\_\_\_ft.]* The borings were drilled to a maximum depth of \_\_\_\_\_ ft.

**Soils**

**Slopes**

The proposed project site is at approximately \_\_\_\_ feet above mean sea level and has a general slope of approximately \_\_\_\_%. There is a difference in elevation of about \_\_\_\_ feet across the site.

**Drainage Patterns (onsite/offsite)**

The drainage generally flows in a \_\_\_\_\_ direction towards \_\_\_\_\_ *[street/avenue]*. The *[north/south/east/west]* adjacent property has drainage patterns directed towards the school site.

**II. STORMWATER TREATMENT STRATEGY**

**A. Description of Proposed Site Drainage**

**B. Site Drainage Areas, Land Uses and Proposed BMP Table**

Drainage Area	Land Use	BMP Selected	Treatment Type
A	Buildings/Roofs and Associated Landscaped Areas; Playfield	GS-1 Hydrodynamic Separator; GS-1 Catch Basin Inserts	Pre-Treatment
		INF-3 Proprietary Infiltration BMP	Highly Recommended Structural Treatment BMP
B	Buildings/Roofs and Associated Landscaped Areas	BIO-2 Planter Boxes	Recommended Structural Treatment BMP
C	Outdoor Eating Area	GS-2 Catch Basin Inserts	Pre-Treatment
		BIO-1 Bioretention	Highly Recommended Structural Treatment BMP
D	Roadway, Driveways and Parking Lot	INF-4 Permeable Pavement	Highly Recommended Structural Treatment BMP

**IV. MONITORING AND MAINTENANCE**

See Appendix 3 for additional BMP monitoring and maintenance information. At a minimum:

- The drainage system and the associated structures and BMP shall be maintained according to manufacturer's specification and to ensure maximum pollutant removal efficiencies as needed.
- Debris and other water pollutants removed from BMP during cleanout shall be contained and disposed of in a proper manner as needed.

**V. NON-STRUCTURAL BMP**

Source Control BMP used at this site include:

- SC-1 Landscaping Maintenance and Integrated Pest Management (IPM)
- SC-2 Fountain and Pools

- SC-3 Parking Area Maintenance
- SC-4 Sidewalk and Plaza Maintenance
- SC-5 Leaking Vehicles
- SC-6 Vehicle and Equipment Cleanup
- SC-7 Vehicle/Equipment Repair and Maintenance
- SC-8 Outdoor Storage of Equipment and Materials
- SC-9 Storm Drainage Signage/ Stenciling
- SC-10 Food Service
- SC-11 Outdoor Loading and Unloading
- SC-12 Fire Sprinkler Test Water
- SC-13 Miscellaneous Drain or Wash Water
- SC-14 Waste Handling and Disposal
- SC-15 Safer Alternative Products
- SC-16 Spill Prevention Control and Cleanup

**VI. OTHER INFORMATION**

**VII. APPENDIXES**

**APPENDIX 1 - VICINITY MAP**

**APPENDIX 2 - SCHEMATIC OF POST CONSTRUCTION BMP**

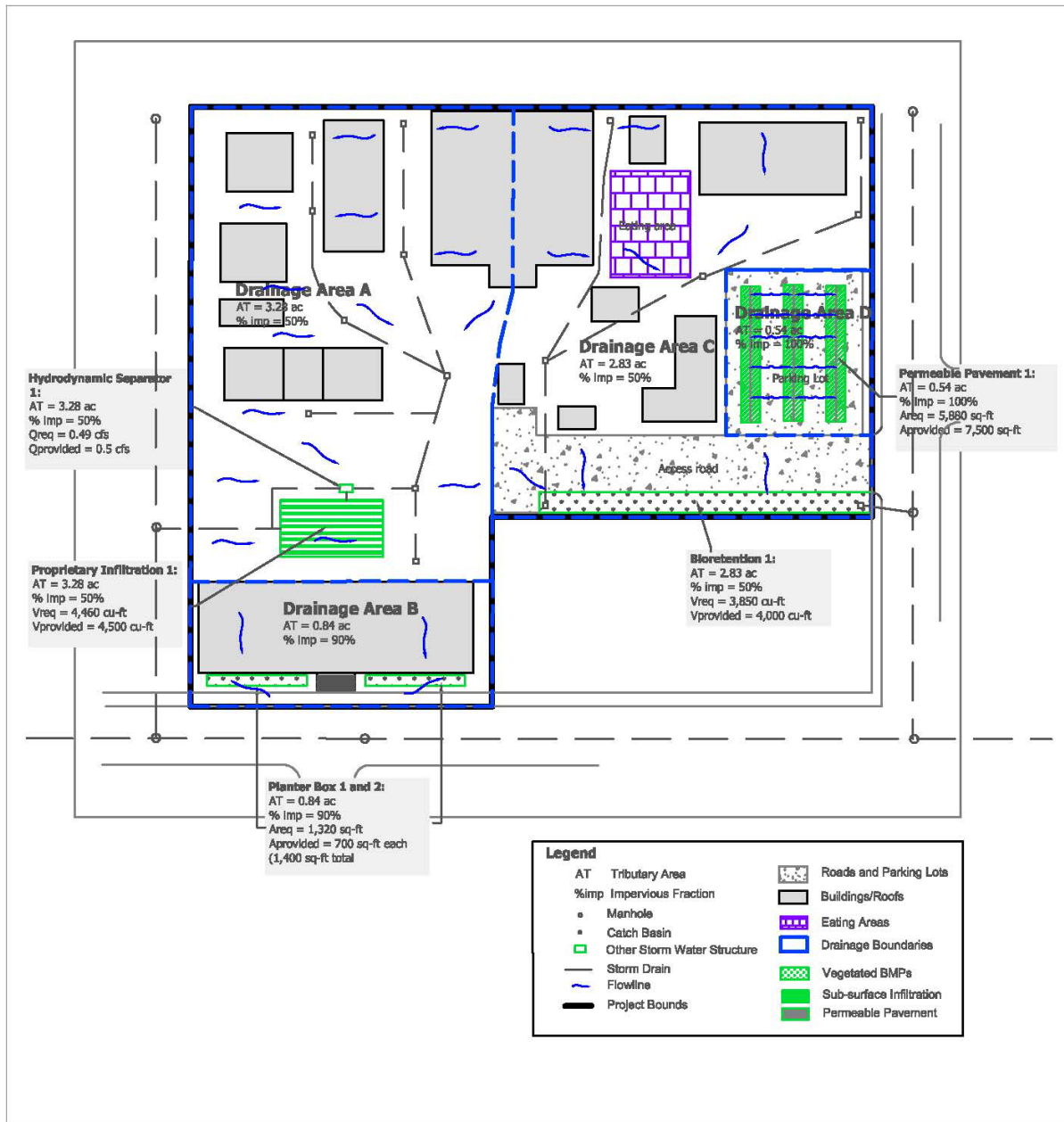
**APPENDIX 3 - BMP MONITORING AND MAINTENANCE**

**APPENDIX 4 - BMP MAINTENANCE LOGS**



**APPENDIX 1: VICINITY MAP**

**APPENDIX 2 : SCHEMATIC OF POST CONSTRUCTION BMP (Sample Provided Below):**



**APPENDIX 3 - BMP MONITORING AND MAINTENANCE**

**APPENDIX 4 BMP MAINTENANCE LOGS (Sample Provided Below):**

**CONTRACTOR BMP INSTALLATION  
AND MAINTENANCE LOG**

**BMP (MANUFACTURER/MODEL#):** \_\_\_\_\_  
**BMP LOCATION:** \_\_\_\_\_  
**DATE INSTALLED:** \_\_\_\_\_  
**ID TAG (ID#/SERIAL#/LOCATION):** \_\_\_\_\_  
 (ATTACH SITE PLAN AND PICTURE(S) SHOWING BMP LOCATION AND ID TAG)

**BMP PROTECTION/ MAINTENANCE INSTRUCTIONS**

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**MAINTENANCE**

DATE MAINTENANCE PERFORMED	NEXT SCHEDULED DATE	COMMENTS/ SUMMARY OF MAINTENANCE PERFORMED
OWNER'S REPRESENTATIVE NAME _____ SIGNATURE _____ DATE _____		CONTRACTOR NAME _____ SIGNATURE _____ DATE _____

END OF ATTACHMENT "A"

**ATTACHMENT "B"**

*POST-CONSTRUCTION WATER BALANCE CALCULATOR*

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